FEATURES

- Digital Output
- LED Pulse Cycle Duration: 32 ms
- Range: 10 to 80 cm
- Typical response time: 39 ms
- Typical start up delay: 44 ms
- Average Current Consumption: 30 mA
- Detection Area Diameter @ 80 cm: 12 cm

DESCRIPTION

The GP2Y0A21YK is a wide-angle distance measuring sensor.
ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Ta = 25°C, V_{CC} = 5 VDC

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>V_{CC}</td>
<td>-0.3 to +7</td>
<td>V</td>
</tr>
<tr>
<td>Output Terminal Voltage</td>
<td>V_{O}</td>
<td>-0.3 to (V_{CC} +0.3)</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Topr</td>
<td>-10 to +60</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstg</td>
<td>-40 to +70</td>
<td>°C</td>
</tr>
</tbody>
</table>

Operating Supply Voltage

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Supply Voltage</td>
<td>V_{CC}</td>
<td>4.5 to 5.5</td>
<td>V</td>
</tr>
</tbody>
</table>

Electro-optical Characteristics

Ta = 25°C, V_{CC} = 5 VDC

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Distance Range</td>
<td>ΔL</td>
<td>L = 80 cm</td>
<td>10</td>
<td>-</td>
<td>80</td>
<td>cm</td>
<td>1, 2</td>
</tr>
<tr>
<td>Output Terminal Voltage</td>
<td>V_{O}</td>
<td>L = 80 cm</td>
<td>0.25</td>
<td>0.4</td>
<td>0.55</td>
<td>V</td>
<td>1, 2</td>
</tr>
<tr>
<td>Output Voltage Difference</td>
<td>ΔV_{O}</td>
<td>Output change at ΔL (80 cm - 10 cm)</td>
<td>1.65</td>
<td>1.9</td>
<td>2.15</td>
<td>V</td>
<td>1, 2</td>
</tr>
<tr>
<td>Average Supply Current</td>
<td>I_{CC}</td>
<td>L = 80 cm</td>
<td>-</td>
<td>30</td>
<td>40</td>
<td>mA</td>
<td>1, 2</td>
</tr>
</tbody>
</table>

NOTES:
1. Using reflective object: white paper (made by Kodak Co. Ltd.) gray cards R-27, white face, reflective ratio: 90%
2. L = Distance to reflective object.

Figure 3. Timing Diagram
REALIABILITY

The reliability of requirements of this device are listed in Table 1.

Table 1. Reliability

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>FAILURE JUDGEMENT CRITERIA</th>
<th>SAMPLES (n), DEFECTIVE (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Cycling</td>
<td>One cycle -40°C (30 min.) to +70°C in 30 minutes, repeated 25 times</td>
<td>$n = 11, C = 0$</td>
<td></td>
</tr>
<tr>
<td>High Temperature and High Humidity Storage</td>
<td>+40°C, 90% RH, 500h</td>
<td>$n = 11, C = 0$</td>
<td></td>
</tr>
<tr>
<td>High Temperature Storage</td>
<td>+70°C, 500h</td>
<td>$n = 11, C = 0$</td>
<td></td>
</tr>
<tr>
<td>Low Temperature Storage</td>
<td>-40°C, 500h</td>
<td>$n = 11, C = 0$</td>
<td></td>
</tr>
<tr>
<td>Operation Life (High Temperature)</td>
<td>+60°C, $V_{CC} = 5$ V, 500h</td>
<td>$n = 11, C = 0$</td>
<td></td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>100 m/s², 6.0 ms 3 times/±X, ±Y, ±Z direction</td>
<td>$n = 6, C = 0$</td>
<td></td>
</tr>
<tr>
<td>Variable Frequency Vibration</td>
<td>10-to-55-to-10 Hz in 1 minute Amplitude: 1.5 mm 2h in each X, Y, Z direction</td>
<td>$n = 6, C = 0$</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. Test conditions are according to Electro-optical Characteristics, shown on page 2.
2. At completion of the test, allow device to remain at nominal room temperature and humidity (non-condensing) for two hours.
3. Confidence level: 90%, Lot Tolerance Percent Defect (LTPD): 20%/40%.

MANUFACTURER’S INSPECTION

Inspection Lot
Inspection shall be carried out per each delivery lot.

Inspection Method
A single sampling plan, normal inspection level II based on ISO 2859 shall be adopted.

Table 2. Quality Level

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>INSPECTION ITEM/TEST METHOD</th>
<th>AQL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Defect</td>
<td>Electro-optical characteristics defect</td>
<td>0.4</td>
</tr>
<tr>
<td>Minor Defect</td>
<td>Defect on appearance and dimension (crack, split, chip, scratch, stain)*</td>
<td>1.0</td>
</tr>
</tbody>
</table>

NOTE: *Any one of these that affects the Electro-optical Characteristics shall be considered a defect.
Figure 4. GP2Y0A021YK Example of Output Distance Characteristics

NOTES:

- White paper (Reflectance ratio 90%)
- Gray paper (Reflectance ratio 18%)
Figure 5. GP2Y0A021YK Example of Output Characteristics with Inverse Number of Distance

NOTES:
- White paper (Reflectance ratio 90%)
- Gray paper (Reflectance ratio 18%)

GP2Y0A21YK-7
PACKAGE SPECIFICATIONS

STAMP EXAMPLE

2Y0A21 5 3
Month (1 to 9, X, Y, Z)
Year (2005:5)
Model Name

STAMP

LIGHT EMITTER SIDE

R3.75

LIGHT DETECTOR SIDE

R3.75

PCB CONNECTOR

LIGHT EMITTER SIDE

R3.75

LENS CASE

MATERIAL

Lens: Acrylic acid resin
(Visible light cut-off resin)
Case: Carbonic ABS
(Electro-conductive resin)
PCB: Paper phenol

CONNECTOR SIGNAL

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V_O</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>V_CC</td>
</tr>
</tbody>
</table>

NOTES:
1. Dimensions shall reference lens center.
2. Unspecified tolerance shall be ±0.3 mm.
3. (): Reference value.
4. Scale: 2/1, dimensions are in mm.

Connector: J.S.T. Trading Company, LTD
S3B-PH
PACKING SPECIFICATION

---

**PART NAME** | **MATERIAL**
---|---
Packing case | Corrugated cardboard
Pad | Corrugated cardboard
Tray | Polystyrene

**PACKING METHOD**
1. Each tray holds 50 pieces. Packing methods are shown in (A).
2. Each box holds 10 trays. Pads are added to top and bottom, and between layers, as in (B).
   - top and bottom: Put pads between each tray (9 pads total) see above drawing (B).
3. The box is sealed with craft tape. (C) shows the location of the Model number, Quantity, and Inspection date.
4. Package weight: Approximately 4 kg.

---

(A) TRAY
(B) PACKING CASE
(C) PACKING TAPE

---

GP2Y0A21YK-9
NOTES

- Keep the sensor lens clean. Dust, water, oil, and other contaminants can deteriorate the characteristics of this device. Applications should be designed to eliminate sources of lens contamination.

- When using a protective cover over the emitter and detector, ensure the cover efficiently transmits light throughout the wavelength range of the LED ($\lambda = 850$ nm $\pm$ 70 nm). Both sides of the protective cover should be highly polished. Use of a protective cover may decrease the effective distance over which the sensor operates. Ensure that any cover does not negatively affect the operation over the intended application range.

- Objects in proximity to the sensor may cause reflections that can affect the operation of the sensor.

- Sources of high ambient light (the sun or strong artificial light) may affect measurement. For best results, the application should be designed to prevent interference from direct sunlight or artificial light.

- Using the sensor with a mirror can induce measurement errors. Often, changing the incident angle on the mirror can correct this problem.

- If a prominent boundary line exists in the surface being measured, it should be aligned vertically to avoid measurement error. See Figure 6 for further details.

- When measuring the distance to objects in motion, align the sensor so that the motion is in the horizontal direction instead of vertical. Figure 7 illustrates the preferred alignment.

- A 10 µF (or larger) bypass capacitor between $V_{CC}$ and GND near the sensor is recommended.

- To clean the sensor, use a dry cloth. Use of any liquid to clean the device may result in decreased sensitivity or complete failure.

- Excessive mechanical stress can damage the internal sensor or lens.

Figure 6. Proper Alignment to Surface Being Measured

Figure 7. Proper Alignment to Moving Surfaces
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