GP2A231LRSAF
GP2A230LRS0F
GP2A230LRSAF

Snap-in type
Detecting Distance : 1 to 9mm
*OPIC Output,
Reflective Photointerrupter with Connector

■ Description

GP2A230LRS0F Series are standard, OPIC output, reflective photointerrupters with emitter and detector facing the same direction in a molding that provides non-contact sensing. This family of devices uses light modulation to reduce the affects of disturbing light, and the sensor is optimized to work in the selected focal distance. A 3-pin connector is included to allow remote-mount or off-board designs.

■ Features

1. Reflective with OPIC Light Modulated Output
2. Highlights :
   • Position pin to prevent mis-alignment.
   • Snap-mount positioning hooks
     (GP2A230LRSAF, GP2A231LRSAF)
   • Includes additional screw fixing holes
     (GP2A230LRS0F)
   • Short focal distance
3. Key Parameters :
   • Detecting distance : 1 to 9mm (White paper)
     3 to 7mm (Black paper)
   • Undetecting distance : over 27mm (White paper)
   • Connector : GP2A230LRSAF ; Tyco Electronics Japan G.K.
     (PN : 292133-3)
   • GP2A230LRS0F ; Tyco Electronics Japan G.K.
     (PN : 292133-3)
   • GP2A231LRSAF ; Japan Molex K.K.
     (PN : 53401-0335)
4. RoHS directive compliant

■ Agency approvals/Compliance

1. Compliant with RoHS directive

■ Applications

1. General purpose detection of paper presence or motion.
2. Example : PPC, FAX, Printer

* "OPIC" (Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and a signal-processing
Internal Connection Diagram

Outline Dimensions

GP2A231LRSAF

- Dimensions:
  - Optical center: 6.7, 8.45
  - Connector: 53401-0335 (JAPAN molex K.K.)

- Tolerance:
  - ±0.2 for dimensions less than 6
  - ±0.3 for dimensions 6 or more less than 14
  - ±0.4 for dimensions 14 or more

- Date code:
  - φ1.5
  - 2-3.3

- Product mass: approx. 1.4g

GP2A230LRS0F

- Dimensions:
  - Optical center: 6.2, 9.4
  - Connector: 292133-3 (Tyco Electronics Japan K.K.)

- Tolerance:
  - ±0.2 for dimensions less than 6
  - ±0.3 for dimensions 6 or more less than 14
  - ±0.4 for dimensions 14 or more

- Date code:
  - φ3.2
  - 3.1

- Product mass: approx. 1.42g

Connector terminal plating material: Sn
GP2A230LRSAF

Product mass: approx. 1.42g

Connector terminal plating material: Sn
### Date code (2 digit)

<table>
<thead>
<tr>
<th>Year of production</th>
<th>1st digit</th>
<th>2nd digit</th>
<th>Month of production</th>
<th>2nd digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.D.</td>
<td>Mark</td>
<td>Month</td>
<td>Mark</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>9</td>
<td>10</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>11</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>:</td>
<td>:</td>
<td>12</td>
<td>Z</td>
<td></td>
</tr>
</tbody>
</table>

repeats in a 10 year cycle

### Country of origin

- Japan or China
  (Indicated on the packing case)
### Absolute Maximum Ratings \((T_a=25^\circ C)\)

<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>-0.5 to +7</td>
<td>V</td>
</tr>
<tr>
<td>Output voltage</td>
<td>(V_O)</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td><strong>1</strong> Output current</td>
<td>(I_{OL})</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>(T_{opr})</td>
<td>-10 to +70</td>
<td>(^\circ C)</td>
</tr>
<tr>
<td><strong>2</strong> Storage temperature</td>
<td>(T_{stg})</td>
<td>-20 to +80</td>
<td>(^\circ C)</td>
</tr>
</tbody>
</table>

**1** Sink current refer to Fig.5.  
**2** The connector should be plugged in/out at normal temperature.

### Electro-optical Characteristics \((T_a=25^\circ C)\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>(V_{CC})</td>
<td>–</td>
<td>4.75</td>
<td>–</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>Current dissipation (I)</td>
<td>(I_{CC})</td>
<td>Smoothing value (V_{CC}=5V), (R_L=\infty)</td>
<td>–</td>
<td>–</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td><strong>3</strong> Current dissipation (II)</td>
<td>(I_{CCP})</td>
<td>Pulse peak value (V_{CC}=5V)</td>
<td>–</td>
<td>–</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Low level output voltage</td>
<td>(V_{OL})</td>
<td>(V_{CC}=5V), (I_{OL}=16mA), at detecting time</td>
<td>–</td>
<td>–</td>
<td>0.4</td>
<td>V</td>
</tr>
<tr>
<td>High level output voltage</td>
<td>(V_{OH})</td>
<td>(V_{CC}=5V), (R_L=1k\Omega), at non detecting time</td>
<td>4.5</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td><strong>4</strong> Non detection distance</td>
<td>(L_{LHL})</td>
<td>KODAK Gray Cards, (V_{CC}=5V)</td>
<td>–</td>
<td>–</td>
<td>27</td>
<td>mm</td>
</tr>
<tr>
<td><strong>4</strong> Detection distance</td>
<td>(L_{HLS})</td>
<td>KODAK Gray Cards, (V_{CC}=5V)</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black paper, (V_{CC}=5V)</td>
<td>–</td>
<td>–</td>
<td>3</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td>(L_{HLL})</td>
<td>KODAK Gray Cards, (V_{CC}=5V)</td>
<td>9</td>
<td>–</td>
<td>–</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black paper, (V_{CC}=5V)</td>
<td>7</td>
<td>–</td>
<td>–</td>
<td>mm</td>
</tr>
<tr>
<td><strong>5</strong> Response time</td>
<td>(t_{PLH})</td>
<td>(V_{CC}=5V)</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>(t_{PHL})</td>
<td></td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>ms</td>
</tr>
<tr>
<td><strong>6</strong> Acceptable illuminance</td>
<td>(E_{v1})</td>
<td></td>
<td>3000</td>
<td>–</td>
<td>–</td>
<td>lux</td>
</tr>
<tr>
<td></td>
<td>(E_{v2})</td>
<td></td>
<td>1500</td>
<td>–</td>
<td>–</td>
<td>lux</td>
</tr>
</tbody>
</table>

**3** Refer to Fig.1.  
**4** Refer to Fig.2.  
**5** Refer to Fig.3.  
**6** Refer to Fig.4.

Reflective object  
Black paper (black) : Standard reflective object (provided by SHARP Corporation)  
KODAK Gray Cards (use the white side reflects about 90%) : Standard reflective object (provided by SHARP Corporation)  
PPC paper : Standard reflective object (provided by SHARP Corporation)
Fig. 1 Test Condition for Peak Pulse Value $I_{CCP}$

- Reflective photointerrupter

Fig. 2 Test Condition for Detecting Distance Characteristics

- Reflective object
- Detection surface
- Output $V_O$
- $V_{OH}$
- $V_{OL}$

Fig. 3 Test Circuit for Response Time

- Reflective object
- Detection surface
- RL=1kΩ
- 1.5V
- V_{OUT} waveform

Fig. 4 Test Condition for External Disturbing Light Illuminance

- $E_{V1}$: At non-detecting
- Light source A
- Emission/detection surface
- Reflective photointerrupter
- Illuminance shall be that on the emission/detection surface. Output shall not go from "H" to "L".

- $E_{V2}$: At detecting
- Light source A
- Emission/detection surface
- PPC paper
- 7mm
- Reflective photointerrupter
- Illuminance shall be that on the reflective object. Output shall not go from "L" to "H".
Fig. 5 Low Level Output Current vs. Ambient Temperature

Remarks: Please be aware that all data in the graph are just for reference and not for guarantee.
### Design Considerations

#### Design guide

1) This product operates the light emitter by pulse drive. Please supply the stable supply voltage in order to prevent error operation by pulse current. Please use this device after connecting a capacitor between $V_O$ and GND for prevention of line noise.

2) Prevention of detection error

   Please be careful that you need to keep the direct inverter light away from the photo detecting surface since the device will not operate correctly in such case. In addition, we recommend to make sure the operation test in the actual application.

3) Plugging in/out

   The connector should be plugged in/out at normal temperature.

This product is not designed against irradiation and incorporates non-coherent IRED.

#### Recommended Installation Hole drawing

1) We recommend to fix the product at punching side on the fixing plate (metal plate).

2) Please decide the final dimensions at your side after confirmation by the actual applications, Because mounting efficiency and mounted stabilization are dependent on mounting hole corner curve and punched state.

3) Tolerance shall be ±0.1mm

Normal type (Thickness of plate : 1mm)

```
<table>
<thead>
<tr>
<th>GP2A231LRSASF</th>
<th>GP2A230LRSASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-R0.1</td>
<td>8-R0.1</td>
</tr>
<tr>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>17.1±1</td>
<td>17.1±1</td>
</tr>
</tbody>
</table>
```
Reverse-insertion prevention type  (Thickness of plate : 1mm)

GP2A231LRSAF  GP2A230LRSAF

- **Parts**
  This product is assembled using the below parts.

- **Photodetector (qty. : 1)**  [Using a silicon photodiode as light detecting portion, and a bipolar IC as signal processing circuit]

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum Sensitivity wavelength (nm)</th>
<th>Sensitivity wavelength (nm)</th>
<th>Response time (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photodiode</td>
<td>900</td>
<td>700 to 1 200</td>
<td>400</td>
</tr>
</tbody>
</table>

Using a silicon photodiode as light detecting portion, and a bipolar IC as signal processing circuit.

- **Photo emitter (qty. : 1)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Material</th>
<th>Maximum light emitting wavelength (nm)</th>
<th>I/O Frequency (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrared emitting diode</td>
<td>Gallium arsenide (GaAs)</td>
<td>950</td>
<td>0.3</td>
</tr>
<tr>
<td>(non-coherent)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Material**

<table>
<thead>
<tr>
<th>Case</th>
<th>Lens</th>
<th>Bottom cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black polyphylene Sulfide resin (UL94 V-0)</td>
<td>Polycarbonate resin (UL94 V-2)</td>
<td>Polycarbonate resin (Black) (UL94 V-2)</td>
</tr>
</tbody>
</table>

- **Others**
  Laser generator is not used.
Manufacturing Guidelines

● Cleaning instructions
  Polycarbonate resin is used as the material of the lens surface. So this product shall not be cleaned by
  cleaning solvent absolutely. Dust and stain shall clean by air blow, or shall clean by soft cloth.

● Presence of ODC
  This product shall not contain the following materials.
  And they are not used in the production process for this product.
  Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

  Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

  This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).
  • Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated
diphenyl ethers (PBDE).
Package specification

● Sleeve package

Package materials
- Anti-static plastic bag: Polyethylene
- Moltopren: Urethane
- Packing case: Corrugated fiberboard

Package method
- 100 pcs of products shall be packaged in a plastic bag, Ends shall be sealed by stapler. The bottom of the packing case is covered with moltopren, and 3 plastic bags shall be put into the packing case.
- Moltopren should be located after all products are settled (1 packing contains 300 pcs).

Packing composition

![Diagram of packaging](image-url)
Important Notices

- The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP’s devices.

- Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.

- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which do not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:
  (i) The devices in this publication are designed for use in general electronic equipment designs such as:
    --- Personal computers
    --- Office automation equipment
    --- Telecommunication equipment [terminal]
    --- Test and measurement equipment
    --- Industrial control
    --- Audio visual equipment
    --- Consumer electronics
  (ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
    --- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
    --- Traffic signals
    --- Gas leakage sensor breakers
    --- Alarm equipment
    --- Various safety devices, etc.
  (iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
    --- Space applications
    --- Telecommunication equipment [trunk lines]
    --- Nuclear power control equipment
    --- Medical and other life support equipment (e.g., scuba).

- If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

- This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.