**GP2A200LCS0F Series**

**Detecting Distance**: 2 to 22mm

*OPIC Output, Reflective Photointerrupter with Connector*

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**Description**

**GP2A200LCS0F Series** are 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:
   - Includes additional screw fixing holes
   - Position pin to prevent mis-alignment
   - Long focal distance
3. Key Parameters:
   - Detecting distance: 2 to 22mm (White paper)
     5 to 15mm (Black paper)
   - Undetecting distance: over 90mm (White paper)
   - Connector: GP2A200LCS0F; Tyco Electronics AMP K.K. (PN: 292133-3)
     GP2A200LCS0F; Tyco Electronics AMP K.K. (PN: 292133-3)
     GP2A240LCS0F; Tyco Electronics AMP K.K. (PN: 292133-3)
     GP2A210LCSJF; Tyco Electronics AMP K.K. (PN: 4-292133-3)
4. RoHS directive compliant

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**Agency approvals/Compliance**

1. Compliant with RoHS directive

**Applications**

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

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

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### Internal Connection Diagram

- **Reflective object**
- **Demodulator circuit**
- **Comparator Oscillator circuit**
- **Sync. detecting circuit**

- **VCC**
- **VOUT**
- **GND**

### Outline Dimensions

#### (Unit: mm)

**GP2A200LCS0F**

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

- **Optical center**
- **Connector: 292133-3 (Tyco Electronics AMP. K.K.)**

- **Product mass:** approx. 1.95g

**GP2A200LCSCF**

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

- **Optical center**
- **Connector: 292133-3 (Tyco Electronics AMP. K.K.)**

- **Product mass:** approx. 2.3g

**GP2A210LCSJF**

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

- **Optical center**
- **Connector: 4-292133-3 (Yellow) (Tyco Electronics AMP. K.K.)**

- **Product mass:** approx. 1.95g

**GP2A240LCS0F**

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

- **Optical center**
- **Connector: 292133-3 (Tyco Electronics AMP. K.K.)**

- **Product mass:** approx. 1.95g

**Connector terminal plating material:** Sn

- **Date code:**
- ***( ) : Reference dimensions***

- **Portion Built-in IR-90 filter**
Date code (2 digit)

<table>
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<th>Year of production</th>
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<th>2nd digit</th>
</tr>
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<td>11</td>
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repeats in a 10 year cycle

Country of origin

Japan
## Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
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</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>30</td>
<td>V</td>
</tr>
<tr>
<td>$^{a1}$ Output current</td>
<td>$I_{OL}$</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>$^{a2}$ Operating temperature</td>
<td>$T_{opr}$</td>
<td>$-10$ to $+70$</td>
<td>°C</td>
</tr>
<tr>
<td>$^{a3}$ Storage temperature</td>
<td>$T_{stg}$</td>
<td>$-20$ to $+80$</td>
<td>°C</td>
</tr>
</tbody>
</table>

$^a1$ Sink current refer to Fig.5.  
$^a2$ The connector should be plugged in/out at normal temperature.

## Electro-optical Characteristics

<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>30</td>
<td>mA</td>
</tr>
<tr>
<td>Current dissipation (II)</td>
<td>$I_{CCP}$</td>
<td>Pulse peak value $V_{CC}=5V$</td>
<td>–</td>
<td>–</td>
<td>150</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>$^a4$ Non detection distance</td>
<td>$L_{ILH}$</td>
<td>KODAK Gray Cards, $V_{CC}=5V$</td>
<td>–</td>
<td>–</td>
<td>90</td>
<td>mm</td>
</tr>
<tr>
<td>$^a4$ Detection distance</td>
<td>$L_{HLS}$</td>
<td>KODAK Gray Cards, $V_{CC}=5V$</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black paper, $V_{CC}=5V$</td>
<td>–</td>
<td>–</td>
<td>5</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td>$L_{HLL}$</td>
<td>KODAK Gray Cards, $V_{CC}=5V$</td>
<td>22</td>
<td>–</td>
<td>–</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black paper, $V_{CC}=5V$</td>
<td>15</td>
<td>–</td>
<td>–</td>
<td>mm</td>
</tr>
<tr>
<td>$^a5$ Response time</td>
<td>$t_{PHL}$</td>
<td>$V_{CC}=5V$</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>$t_{PLH}$</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>ms</td>
</tr>
<tr>
<td>$^a6$ Acceptable illuminance</td>
<td>$E_{v1}$</td>
<td>–</td>
<td>3000</td>
<td>–</td>
<td>–</td>
<td>lx</td>
</tr>
<tr>
<td></td>
<td>$E_{v2}$</td>
<td>–</td>
<td>1500</td>
<td>–</td>
<td>–</td>
<td>lx</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 $I_{CCP}$

- Circuit diagram showing a photointerrupter with a resistance $R_1 = 1 \Omega$, power supply $V_{CC} = 5V$, and ground GND.
- The equation for $I_{CCP}$ is $I_{CCP} = V_r / 1 \Omega$.
- $t_w$ (Typ.) = 8 $\mu$s (GP2A240LCS0F: 2.5 to 9.3 $\mu$s).
- $t_p$ (Typ.) = 130 $\mu$s (GP2A240LCS0F: 40 to 150 $\mu$s).

Fig. 2 Test Condition for Detecting Distance Characteristics

- Diagram showing a reflective object and a detection surface with output $V_O$, detecting distance $L$, and states $L_{HHS}$, $L_{HLL}$, $L_{LHL}$.
- Equation: $I_{CCP} = V_r / 1 \Omega$.
- $t_w$ (Typ.) = 8 $\mu$s (GP2A240LCS0F: 2.5 to 9.3 $\mu$s).
- $t_p$ (Typ.) = 130 $\mu$s (GP2A240LCS0F: 40 to 150 $\mu$s).

Fig. 3 Test Circuit for Response Time

- Circuit diagram showing a photointerrupter with resistance $R_L = 1k \Omega$, power supply $V_{CC} = 5V$, and output $V_{OUT}$.
- Waveform with states $V_{DH}$ and $V_{OL}$.
- With reflective object, $t_{PHL}$ and $t_{PLH}$.
- Without reflective object, $V_{DH}$ and $1.5V$.

Fig. 4 Test Condition for External Disturbing Light Illuminance

- Diagram showing light source A emitting onto an emission/detection surface, PPC paper, and photointerrupter.
- Illuminance shall be that on the emission/detection surface.
- Output shall not go from "H" to "L".
- Light source A shall not emit onto a photointerrupter 15mm away.
- Illuminance shall be that on the reflective object.
- Output shall not go from "L" to "H".

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Sheets No.: D3-A05101FEN
GP2A200LCS0F Series

Fig. 5 Output Current vs. Ambient Temperature

Fig. 6 Low Level Output Voltage vs. Ambient Temperature

Fig. 7 Low Level Output Voltage vs. Low Level Output Current

Fig. 8 Dissipation Current (Smoothing Value) 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) VO terminal : Open collector output
   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 V₀ 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.

● Parts

This product is assembled using the below parts.

• Photodetector (Q'ty : 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>Phototransistor</td>
<td>900</td>
<td>700 to 1 200</td>
<td>400</td>
</tr>
</tbody>
</table>

• Photo emitter (Q'ty : 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>
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</tbody>
</table>

• Material

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th>Lens</th>
<th>Bottom cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP2A200LCS0F</td>
<td>Black polyphernylene</td>
<td>Polycarbonate resin (UL94 V-2)</td>
<td>Polycarbonate resin (Gray) (UL94 V-2)</td>
</tr>
<tr>
<td>GP2A200LCSCF</td>
<td>Sulfide resin (UL94 V-0)</td>
<td>Polycarbonate resin (UL94 V-2)</td>
<td>Polycarbonate resin (Gray) (UL94 V-2)</td>
</tr>
<tr>
<td>GP2A210LCSJF*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP2A240LCS0F</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*The IR-90 filter (Fuji Photo Film Co., Ltd.) is inserted between case and detector side lens.

• 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

### Case 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 2 plastic bags shall be put into the packing case.
- Moltopren should be located after all products are settled (1 packing contains 200 pcs).

#### Packing composition
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    --- 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).

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