GP2S24J0000F Series

Detecting Distance : 0.7mm
Phototransistor Output,
Compact Reflective
Photointerrupter

Description

GP2S24J0000F Series is a compact-package, phototransistor output, reflective photointerrupter, with emitter and detector facing the same direction in a molding that provides non-contact sensing. The compact package series is a result of unique technology, combing transfer and injection molding, that also blocks visible light to minimize false detection.

Features

1. Reflective with Phototransistor Output
2. Highlights :
   • Compact Size
3. Key Parameters :
   • Optimal Sensing Distance : 0.7mm
   • Package : 4×3×1.7mm
   • Visible light cut resin package
4. Lead free and RoHS directive compliant

Agency approvals/Compliance

1. Compliant with RoHS directive

Applications

1. Detection of object presence or motion.
2. Example : printer, optical storage

Notice

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■ Internal Connection Diagram

1. Anode
2. Emitter
3. Collector
4. Cathode

■ Outline Dimensions (Unit : mm)

Product mass : approx. 0.04g
Plating material : SnCu (Cu : TYP. 2%)

- Tolerance : ±1.5mm
- ( ) : Reference dimensions
- The dimensions indicated by * refer to those measured from the lead bending part.
- The dimensions shown do not include burr.
  Burr's dimension : 0.15mm MAX.
Date code (Symbol)

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

Rank mark
There is no rank indicator.

Country of origin
Japan
### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward current</td>
<td>I_F</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>V_R</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P</td>
<td>75</td>
<td>mW</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>V_CE</td>
<td>35</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-collector voltage</td>
<td>V_EC</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>Collector power dissipation</td>
<td>P_C</td>
<td>75</td>
<td>mW</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>P_tot</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>T_ope</td>
<td>-25 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_stg</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>T_sol</td>
<td>260</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1 For 5s or less

### Electro-optical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>V_F</td>
<td>I_F=20mA</td>
<td>1.2</td>
<td>1.4</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Reverse current</td>
<td>I_R</td>
<td>V_R=6V</td>
<td></td>
<td>10</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector dark current</td>
<td>I_CED</td>
<td>V_CE=20V</td>
<td></td>
<td>1</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>Transfer characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector Current</td>
<td>I_C</td>
<td>I_F=4mA, V_CE=2V</td>
<td>20</td>
<td>45</td>
<td>120</td>
<td>μA</td>
</tr>
<tr>
<td>Response time</td>
<td>t_r</td>
<td>V_CE=2V, I_C=100μA, R_L=1kΩ, d=1mm</td>
<td></td>
<td>20</td>
<td>100</td>
<td>μs</td>
</tr>
<tr>
<td>Fall time</td>
<td>t_f</td>
<td></td>
<td></td>
<td>20</td>
<td>100</td>
<td>μs</td>
</tr>
<tr>
<td>Leak current</td>
<td>I_LEAK</td>
<td>I_F=4mA, V_CE=2V</td>
<td></td>
<td></td>
<td>100</td>
<td>nA</td>
</tr>
</tbody>
</table>

*2 The condition and arrangement of the reflective object are shown below.
*3 Without reflective object.

#### Test Condition and Arrangement for Collector Current

- Al evaporation
- d=1mm glass plate
### Model Line-up

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Rank</th>
<th>Collector current I&lt;sub&gt;c&lt;/sub&gt;[μA] (I&lt;sub&gt;f&lt;/sub&gt;=4mA, V&lt;sub&gt;CE&lt;/sub&gt;=2V, T&lt;sub&gt;a&lt;/sub&gt;=25°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP2S24J0000F</td>
<td>A, B or C</td>
<td>20 to 120</td>
</tr>
<tr>
<td>GP2S24BJ000F</td>
<td>B</td>
<td>34 to 71</td>
</tr>
<tr>
<td>GP2S24CJ000F</td>
<td>C</td>
<td>58 to 120</td>
</tr>
<tr>
<td>GP2S24ABJ00F</td>
<td>A or B</td>
<td>20 to 71</td>
</tr>
<tr>
<td>GP2S24BCJ00F</td>
<td>B or C</td>
<td>34 to 120</td>
</tr>
</tbody>
</table>

* The ratio of each rank can not be guaranteed.

Please contact a local SHARP sales representative to inquire about production status.
Fig. 7 Collector Dark Current vs. Ambient Temperature

![Graph showing collector dark current (ICEO) vs. ambient temperature (T_a)].

Fig. 8 Response Time vs. Load Resistance

![Graph showing response time (t) vs. load resistance (R_L)].

Fig. 9 Test Circuit for Response Time

![Schematic diagram of the test circuit for response time].

Fig. 10 Relative Collector Current vs. Distance (Reference value)

![Graph showing relative collector current (%) vs. distance between sensor and Al evaporation glass (d)].

Fig. 11 Detecting Position Characteristics (1)

![Graph showing relative collector current (%) vs. card moving distance (L)].

Fig. 12 Detecting Position Characteristics (2)

![Graph showing relative collector current (%) vs. card moving distance (L)].
Fig.13 Test Condition for Distance & Detecting Position Characteristics

Correspond to Fig.10
Al evaporated glass

Correspond to Fig.11
Test condition
I_F = 4mA
V_CE = 2V
d = 1mm

OMS card
White Black

Correspond to Fig.12
Test condition
I_F = 4mA
V_CE = 2V
d = 1mm

OMS card
White Black

Fig.14 Frequency Response

V_CE=2V
L_F=100μA
T_a=25°C

Fig.15 Spectral Sensitivity (Detecting Side)

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

● Design guide

1) Prevention of detection error
   To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

2) Distance characteristic
   Please refer to Fig.10 (Relative collector current vs. Distance) to set the distance of the photointerrupter and the object.

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

● Degradation

In general, the emission of the IRED used in photointerrupter will degrade over time.
In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

● Parts

This product is assembled using the below parts.

• Photodetector (qty. : 1)

<table>
<thead>
<tr>
<th>Category</th>
<th>Material</th>
<th>Maximum Sensitivity wavelength (nm)</th>
<th>Sensitivity wavelength (nm)</th>
<th>Response time (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phototransister</td>
<td>Silicon (Si)</td>
<td>930</td>
<td>700 to 1 200</td>
<td>20</td>
</tr>
</tbody>
</table>

• 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 (non-coherent)</td>
<td>Gallium arsenide (GaAs)</td>
<td>950</td>
<td>0.3</td>
</tr>
</tbody>
</table>

• Material

<table>
<thead>
<tr>
<th>Case</th>
<th>Lead frame</th>
<th>Lead frame plating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black polyphernylene</td>
<td>42Alloy</td>
<td>SnCu plating</td>
</tr>
</tbody>
</table>
Manufacturing Guidelines

● Soldering Method

Flow Soldering:
- Soldering should be completed below 260°C and within 5 s.
- Soldering area is 1mm or more away from the bottom of housing.
- Please take care not to let any external force exert on lead pins.
- Please don't do soldering with preheating, and please don't do soldering by reflow.

Other notice
- Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the cooling and soldering conditions.

● Cleaning instructions

Solvent cleaning:
- Solvent temperature should be 45°C or below. Immersion time should be 3 minutes or less.

Ultrasonic cleaning:
- Do not execute ultrasonic cleaning.

Recommended solvent materials:
- Ethyl alcohol, Methyl alcohol and Isopropyl alcohol.

● 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
Sleeve: Polystyrene
Stopper: Styrene-Butadiene

Package method
MAX. 50 pcs. of products shall be packaged in a sleeve. Both ends shall be closed by tabbed and tabless stoppers.
MAX. 40 sleeves in one case.

Color of sleeve
Rank classification is distinguished by the color of the sleeve as shown in the table below. But the ratio of each rank can not be guaranteed.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Color of sleeve</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yellow</td>
</tr>
<tr>
<td>B</td>
<td>Transparent</td>
</tr>
<tr>
<td>C</td>
<td>Green</td>
</tr>
</tbody>
</table>
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      --- 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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