**GP2S27J0000F Series**

**Description**

GP2S27J0000F 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.

This photointerrupter can be ordered in different CTR ranks, and comes in a surface-mount, gullwing lead package, suitable for reflow soldering.

**Features**

1. Reflective with Phototransistor Output
2. Highlights:
   - Compact Size
   - Surface Mount Type (SMT), reflow soldering, with gullwing leads
   - Optional Tape and Reel (T&R) 1000 pcs per reel
3. Key Parameters:
   - Optimal Sensing Distance: 0.7mm
   - Package: 4×3×1.7mm
   - Visible light cut resin to prevent
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
■ Internal Connection Diagram

1 Anode
2 Emitter
3 Collector
4 Cathode

■ Outline Dimensions (Unit : mm)

Product mass : approx. 0.03g

Plating material : SnCu (Cu : TYP. 2%)
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 (T_A=25°C)**

<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_CEO</td>
<td>35</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-collector voltage</td>
<td>V_ECO</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_opr</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><strong>Soldering temperature</strong></td>
<td>T_sol</td>
<td>260</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1 For 5s or less

**Electro-optical Characteristics (T_A=25°C)**

<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>–</td>
<td>1.2</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Reverse current</td>
<td>I_R</td>
<td>V_R=6V</td>
<td>–</td>
<td>–</td>
<td>10</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_CEO</td>
<td>V_CEO=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>2 Collector Current</td>
<td>I_C</td>
<td>I_F=4mA, V_CEO=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_CEO=2V, I_C=100μA,</td>
<td>–</td>
<td>20</td>
<td>100</td>
<td>μs</td>
</tr>
<tr>
<td>Fall time</td>
<td>t_f</td>
<td>R_L=1kΩ, d=1mm</td>
<td>–</td>
<td>20</td>
<td>100</td>
<td>μs</td>
</tr>
<tr>
<td>3 Leak current</td>
<td>I_LEAK</td>
<td>I_F=4mA, V_CEO=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. The rank splitting of collector current (I_C) shall be executed according to the table below.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Collector current, I_c [μA] (I_F=4mA, V_CEO=2V)</th>
<th>Package sleeve color</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20 to 42</td>
<td>Yellow</td>
</tr>
<tr>
<td>B</td>
<td>34 to 71</td>
<td>Transparent</td>
</tr>
<tr>
<td>C</td>
<td>58 to 120</td>
<td>Green</td>
</tr>
</tbody>
</table>

*3 Without reflective object.

**Test Condition and Arrangement for Collector Current**
### Model Line-up

<table>
<thead>
<tr>
<th>Package</th>
<th>Sleeve</th>
<th>Taping</th>
<th>Rank</th>
<th>Collector current $I_C$ [$\mu$A] ($I_F=4\text{mA}$, $V_{CE}=2\text{V}$, $T_A=25^\circ\text{C}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP2S27J0000F</td>
<td>GP2S27TJ000F</td>
<td>A, B or C</td>
<td>20 to 120</td>
<td></td>
</tr>
<tr>
<td>GP2S27BJ000F</td>
<td>GP2S27T2J000F</td>
<td>B</td>
<td>34 to 71</td>
<td></td>
</tr>
<tr>
<td>GP2S27CJ000F</td>
<td>GP2S27T3J000F</td>
<td>C</td>
<td>58 to 120</td>
<td></td>
</tr>
<tr>
<td>GP2S27ABJ000F</td>
<td>GP2S27T5J000F</td>
<td>A or B</td>
<td>20 to 71</td>
<td></td>
</tr>
<tr>
<td>GP2S27BCJ000F</td>
<td>GP2S27T6J000F</td>
<td>B or C</td>
<td>34 to 120</td>
<td></td>
</tr>
</tbody>
</table>

* The ratio of each rank can not be guaranteed.

Please contact a local SHARP sales representative to see the actual status of the production.
Fig.1 Forward Current vs. Ambient Temperature

Fig.2 Power Dissipation vs. Ambient Temperature

Fig.3 Forward Current vs. Forward Voltage

Fig.4 Collector Current vs. Forward Current

Fig.5 Collector Current vs. Collector-Emitter Voltage

Fig.6 Relative Collector Current vs. Ambient Temperature
Fig. 7 Collector Dark Current vs. Ambient Temperature

Fig. 8 Response Time vs. Load Resistance

Fig. 9 Test Circuit for Response Time

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

Fig. 11 Detecting Position Characteristics (1)

Fig. 12 Detecting Position Characteristics (2)
Fig. 13 Test Condition for Distance & Detecting Position Characteristics

Al evaporated glass

Test condition
- $I_f = 4mA$
- $V_{CE} = 2V$
- $d = 1mm$

OMS card
- White
- Black

1mm

Correspond to Fig. 10

Correspond to Fig. 11

Test condition
- $I_f = 4mA$
- $V_{CE} = 2V$
- $d = 1mm$

OMS card
- White
- Black

1mm

Correspond to Fig. 12

Fig. 15 Spectral Sensitivity (Detecting Side)

Relative sensitivity (%)

0 20 40 60 80 100

600 700 800 900 1000 1200

Wavelength $\lambda$ (nm)

$T_o = 25^\circ C$

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 polyphenylene sulfide resin</td>
<td>42Alloy</td>
<td>SnCu plating</td>
</tr>
</tbody>
</table>
- **Manufacturing Guidelines**

  - **Storage and management after open**

    **Storage condition**
    
    Storage temp.: 5 to 30°C, Storage humidity : 70%RH or less at regular packaging.

    **Treatment after opening the moisture-proof package**
    
    After opening, you should mount the products while keeping them on the condition of 5 to 25°C and 70%RH or less in humidity within 4 days.
    
    After opening the bag once even if the prolonged storage is necessary, you should mount the products within two weeks.
    
    And when you store the rest of products you should put into a DRY BOX. Otherwise after the rest of products and silicagel are sealed up again, you should keep them under the condition of 5 to 30°C and 70%RH or less in humidity.

  - **Baking before mounting**

    When the above-mentioned storage method could not be executed, please process the baking treatment before mounting the products.
    
    However the baking treatment is permitted within one time.
    
    Recommended condition : 125°C, 16 to 24 hours
    
    *Do not process the baking treatment with the product wrapped. When the baking treatment processing, you should move the products to a metallic tray or fix temporarily the products to substrate.

  - **Soldering Method**

    **Reflow Soldering:**
    
    Reflow soldering should follow the temperature profile shown below.
    
    Soldering should not exceed the curve of temperature profile and time.
    
    Please solder within one time.

    ![Temperature Profile Diagram](image-url)
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.

Lead pin

Lead terminals of this product are tin copper alloy plated. Before usage, please evaluate solderability with actual conditions and confirm. And the uniformity in color for the lead terminals are not specified.

● 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
- **Aluminum laminated bag**: Nylone, Polyethylene, Aluminum

### Package method

- MAX. 50 pcs. of products shall be packaged in a sleeve. Both ends shall be closed by tabbed and tableless 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>

## Tape and Reel package

### Package materials

- **Carrier tape**: A-PET (with anti-static material)
- **Cover tape**: PET (three layer system)
- **Reel**: PS

### Package method

- 1000 pcs of products shall be packaged in a reel. One reel with silicagel is encased in aluminum laminated bag. After sealing up the bag, it encased in one case (5 bags/case).
Carrier tape structure and Dimensions

Reel structure and Dimensions

Direction of product insertion

Storage method
Storage conditions should follow the condition shown below.
Storage temperature: 5 to 30°C
Storage humidity: 70% RH or less
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      --- Office automation equipment
      --- Telecommunication equipment [terminal]
      --- Test and measurement equipment
      --- Industrial control
      --- Audio visual equipment
      --- Consumer electronics
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      --- Traffic signals
      --- Gas leakage sensor breakers
      --- Alarm equipment
      --- Various safety devices, etc.
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      --- Telecommunication equipment [trunk lines]
      --- Nuclear power control equipment
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