# GP2S40J0000F

## Detecting Distance : 3mm Phototransistor Output, Compact Reflective Photointerrupter



## ■ Description

**GP2S40J0000F** 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 device has a long focal distance for this family of devices.

## ■ Features

1. Reflective with Phototransistor Output
2. Highlights :
   - Compact Size
3. Key Parameters :
   - Optimal Sensing Distance : 3mm
   - Package : 4×3×2.4mm
   - Visible light cut resin to prevent
4. Lead free and RoHS directive compliant

## ■ Agency approvals/Compliance

1. Compliant with RoHS directive

## ■ Applications

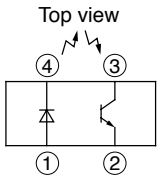
1. Detection of object presence or motion.
2. Example : printer, optical storage

Notice The content of data sheet is subject to change without prior notice.
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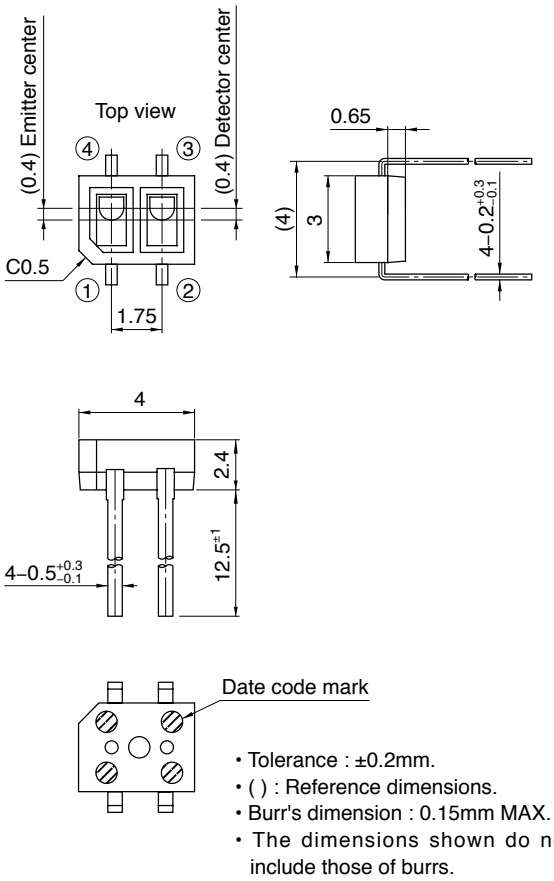
Sheet No.: D3-A02001EN
Date Oct. 3. 2005
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## ■ Internal Connection Diagram




① Anode
② Emitter
③ Collector
④ Cathode

## ■ Outline Dimensions (Unit : mm)



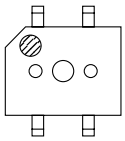

- Tolerance : ±0.2mm.
- ( ) : Reference dimensions.
- Burr's dimension : 0.15mm MAX.
- The dimensions shown do not include those of burrs.

Product mass : approx. 0.085g

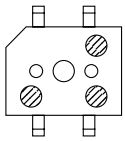
Plating material : SnCu (Cu : TYP. 2%)

## Date code (Symbol)

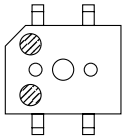
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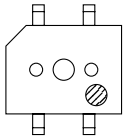
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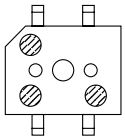
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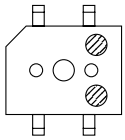
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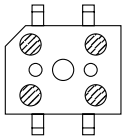
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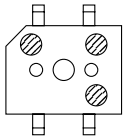
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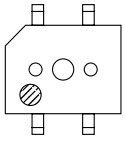
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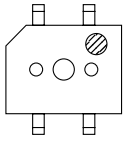
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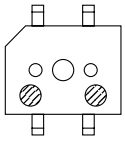
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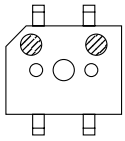
November



June



December



## Country of origin

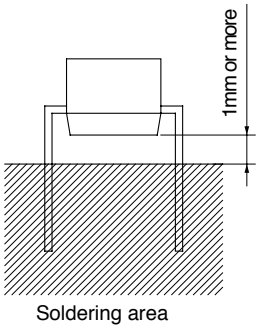
Japan

## ■ Absolute Maximum Ratings

($T_a$=25°C)

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input | Forward current | $I_F$ | 50 | mA |
| | Reverse voltage | $V_R$ | 6 | V |
| | Power dissipation | $P_D$ | 75 | mW |
| Output | Collector-emitter voltage | $V_{CEO}$ | 35 | V |
| | Emitter-collector voltage | $V_{ECO}$ | 6 | V |
| | Collector current | $I_C$ | 20 | mA |
| | Collector power dissipation | $P_C$ | 75 | mW |
| Total power dissipation | | $P_{tot}$ | 100 | mW |
| Operating temperature | | $T_{opr}$ | –25 to +85 | °C |
| Storage temperature | | $T_{stg}$ | –40 to +100 | °C |
| *1Soldering temperature | | $T_{sol}$ | 260 | °C |

*1 For 5s



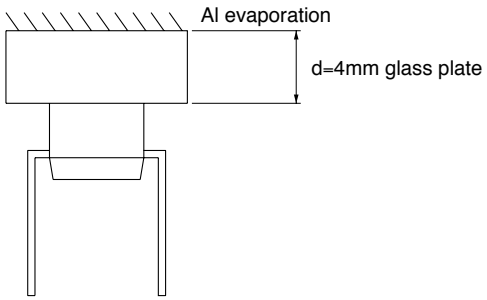

## ■ Electro-optical Characteristics

($T_a$=25°C)

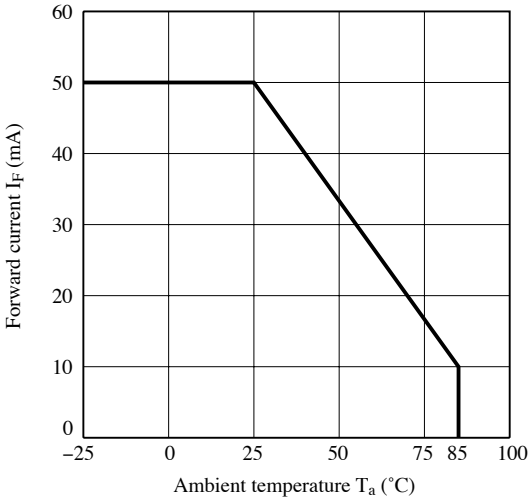
| Parameter | | | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_F$ | $I_F$=20mA | – | 1.2 | 1.4 | V |
| | Reverse current | | $I_R$ | $V_R$=3V | – | – | 10 | μA |
| Output | Collector dark current | | $I_{CEO}$ | $V_{CE}$=20V | – | 1 | 100 | nA |
| Transfer characteristics | *2 Collector Current | | $I_C$ | $I_F$=20mA, $V_{CE}$=5V | 0.5 | – | 3 | mA |
| | *3 Leak current | | $I_{LEAK}$ | $I_F$=20mA, $V_{CE}$=5V | – | – | 500 | nA |
| | Response time | Rise time | $t_r$ | $V_{CE}$=2V, $I_C$=100μA, | – | 50 | 150 | μs |
| | | Fall time | $t_f$ | $R_L$=1kΩ, d=4mm | – | 50 | 150 | |

*2 The condition and arrangement of the reflective object are shown below.
*3 No reflective object

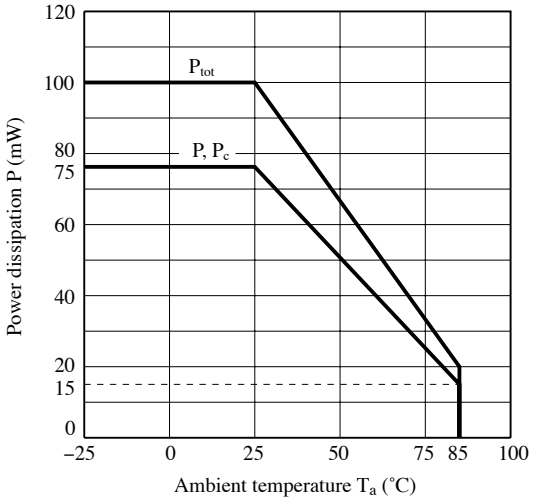
## ● Test Arrangement for Collector Current



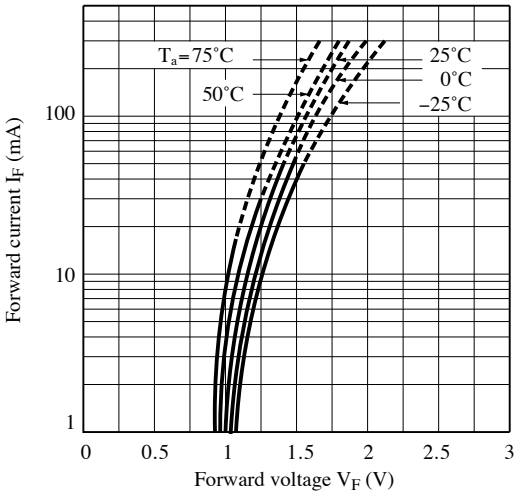
## Fig.1 Forward Current vs. Ambient Temperature



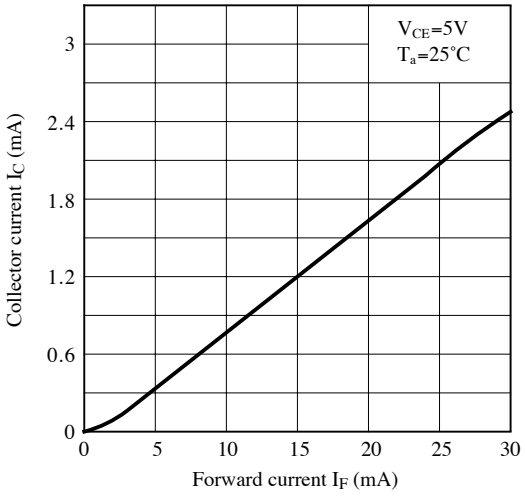

## Fig.2 Collector Power Dissipation vs. Ambient Temperature



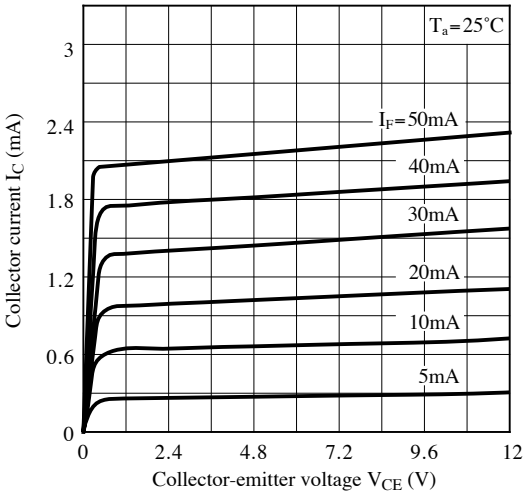

## Fig.3 Forward Current vs. Forward Voltage



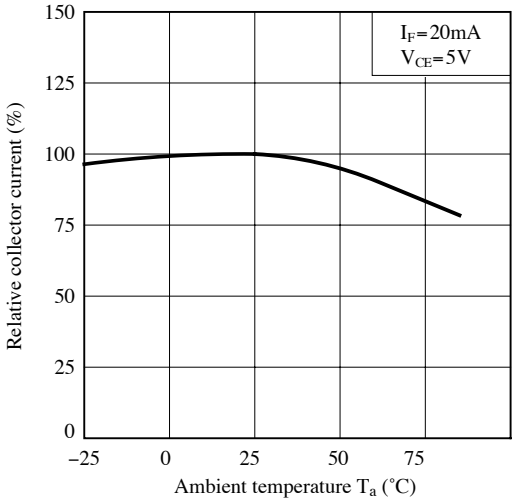

## Fig.4 Collector Current vs. Forward Current



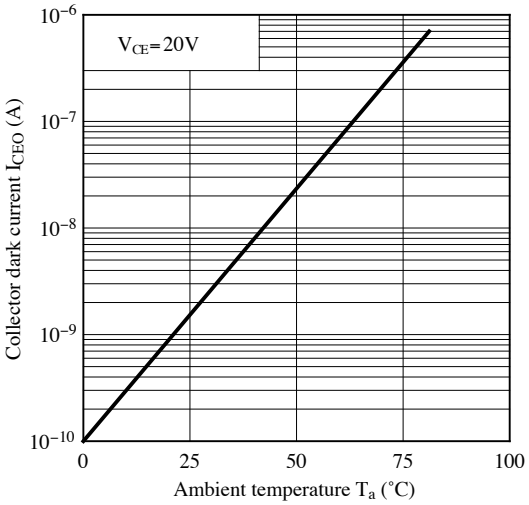

## Fig.5 Collector Current vs. Collector-Emitter Voltage



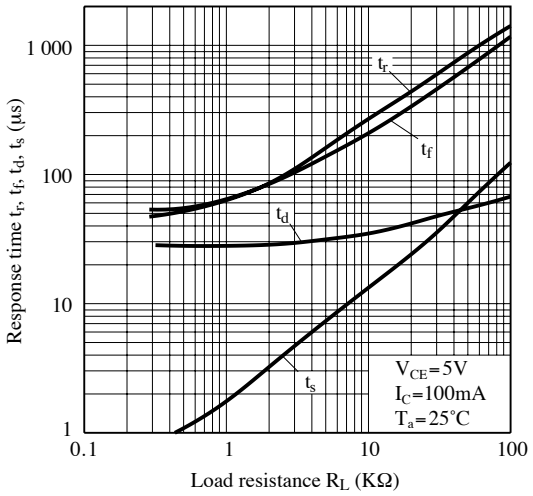

## Fig.6 Relative Collector Current vs. Ambient Temperature



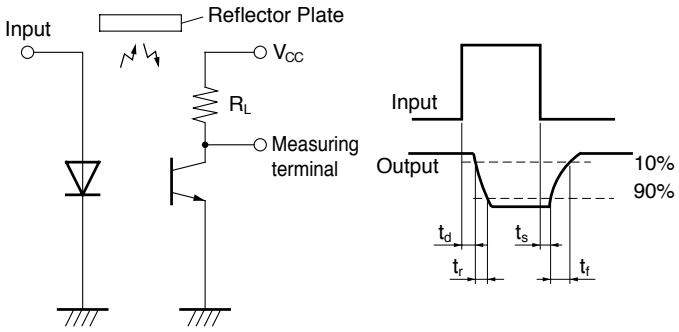
## Fig.7 Collector Dark Current vs. Ambient Temperature



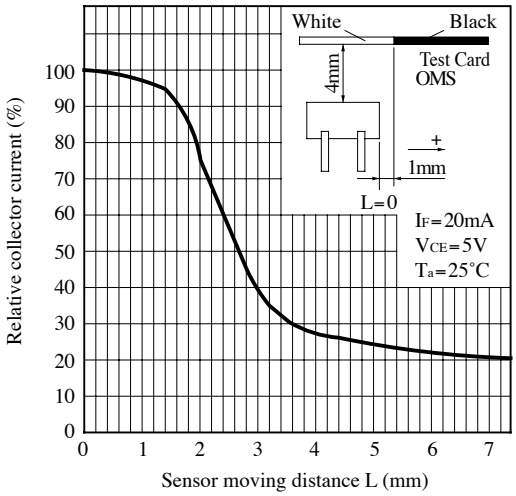

## Fig.8 Response Time vs. Load Resistance



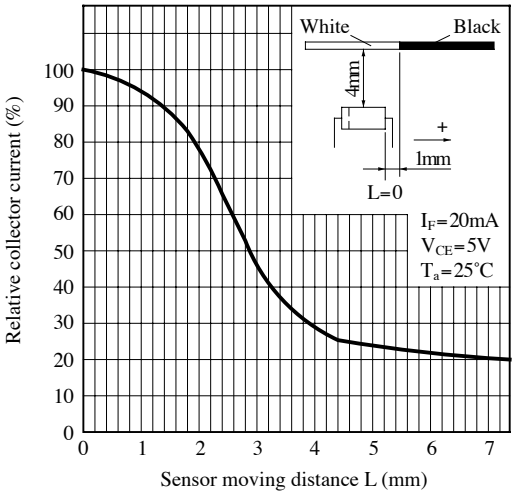

## Fig.9 Test Circuit for Response Time



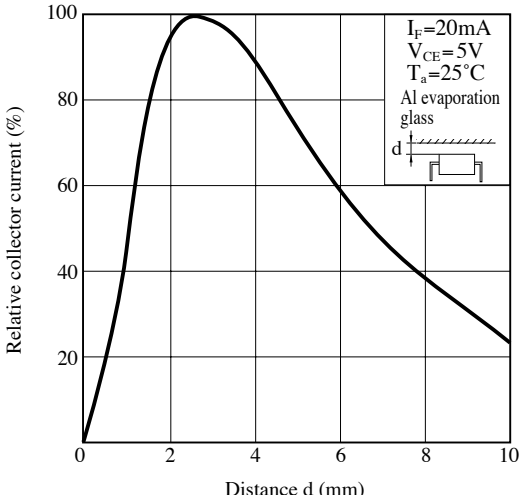

## Fig.10 Detecting Position Characteristics (1)




## Fig.11 Detecting Position Characteristics (2)




## Fig.12 Relative Collector Current vs. Distance (Reference value)




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.12 (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 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)

| Category | Material | Maximum Sensitivity wavelength (nm) | Sensitivity wavelength (nm) | Response time (μs) |
|---|---|---|---|---|
| Phototransister | Silicon (Si) | 930 | 700 to 1 200 | 20 |

• Photo emitter (qty. : 1)

| Category | Material | Maximum light emitting wavelength (nm) | I/O Frequency (MHz) |
|---|---|---|---|
| Infrared emitting diode (non-coherent) | Gallium arsenide (GaAs) | 950 | 0.3 |

• Material

| Case | Lead frame | Lead frame plating |
|---|---|---|
| Black polyphenylene sulfide resin | 42Alloy | SnCu plating |

## ■ 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. 20 sleeves in one case.

## ■ Important Notices

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(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).

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