# GP1S94J0000F

## Gap : 3.5mm Slit : 0.3mm Phototransistor Output, Compact Transmissive Photointerrupter

## ■ Description

**GP1S94J0000F** is a compact-package, photo-transistor output, transmissive photointerrupter, with opposing emitter and detector in a molding that provides non-contact sensing. The compact package series is a result of unique technology combing transfer and injection molding.

This device has a wide gap and positioning pins.

## ■ Features

1. Transmissive with phototransistor output
2. Highlights:
   - Compact Size
   - 2 Positioning Pins of unequal size to prevent misalignment
3. Key Parameters:
   - Gap Width : 3.5mm
   - Slit Width (detector side): 0.3mm
   - Package : 6×3.4×5.2mm
4. Lead free and RoHS directive compliant

## ■ Agency approvals/Compliance

1. Compliant with RoHS directive

## ■ Applications

1. General purpose detection of object presence or motion.
2. Example : printer, lens control for camera





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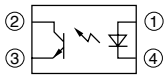
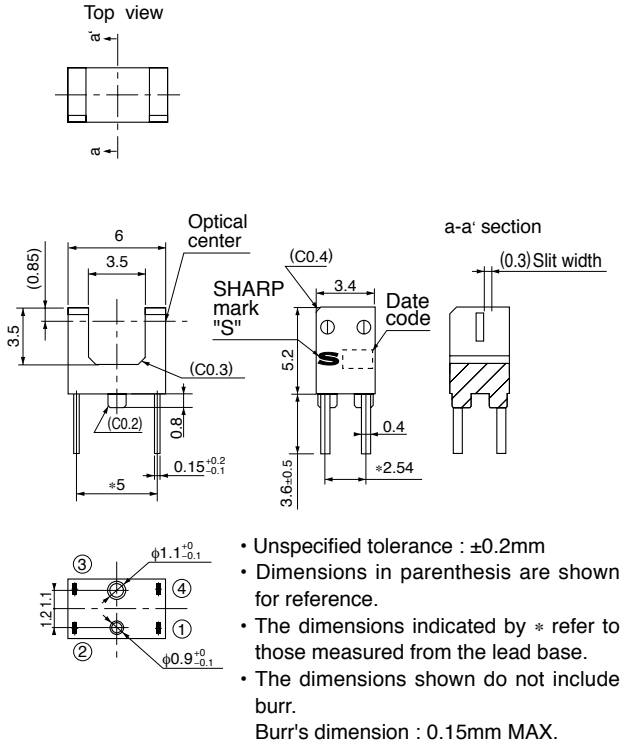
## ■ Internal Connection Diagram

Top view




① Anode
② Collector
③ Emitter
④ Cathode

## ■ Outline Dimensions (Unit : mm)




- Unspecified tolerance : ±0.2mm
- Dimensions in parenthesis are shown for reference.
- The dimensions indicated by ∗ refer to those measured from the lead base.
- The dimensions shown do not include burr.
  Burr's dimension : 0.15mm MAX.

Product mass : approx. 0.12g

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

## Date code (2 digit)

| 1st digit | | 2nd digit | |
|---|---|---|---|
| Year of production | | Month of production | |
| A.D. | Mark | Month | Mark |
| 2000 | 0 | 1 | 1 |
| 2001 | 1 | 2 | 2 |
| 2002 | 2 | 3 | 3 |
| 2003 | 3 | 4 | 4 |
| 2004 | 4 | 5 | 5 |
| 2005 | 5 | 6 | 6 |
| 2006 | 6 | 7 | 7 |
| 2007 | 7 | 8 | 8 |
| 2008 | 8 | 9 | 9 |
| 2009 | 9 | 10 | X |
| 2010 | 0 | 11 | Y |
| : | : | 12 | Z |

repeats in a 10 year cycle

## Rank mark

There is no rank indicator.

## Country of origin

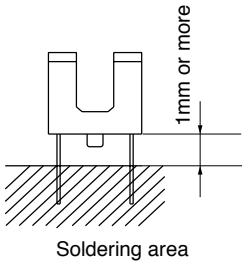
Japan

## ■ 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 | 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 or less

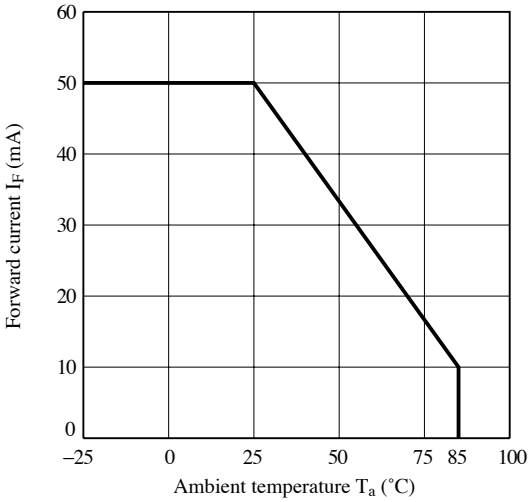



## ■ Electro-optical Characteristics

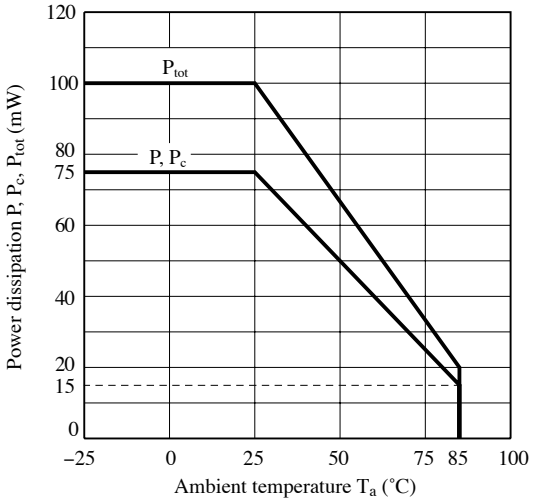
($T_a$=25°C )

| 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 | – | – | 100 | nA |
| Transfer characteristics | Collector current | | $I_C$ | $V_{CE}$=5V, $I_F$=5mA | 40 | – | 400 | μA |
| | Collector-emitter saturation voltage | | $V_{CE(sat)}$ | $I_F$=10mA, $I_C$=40μA | – | – | 0.4 | V |
| | Response time | Rise time | $t_r$ | $V_{CE}$=5V, $I_C$=100μA, $R_L$=1kΩ | – | 50 | 150 | μs |
| | | Fall time | $t_f$ | | – | 50 | 150 | μs |

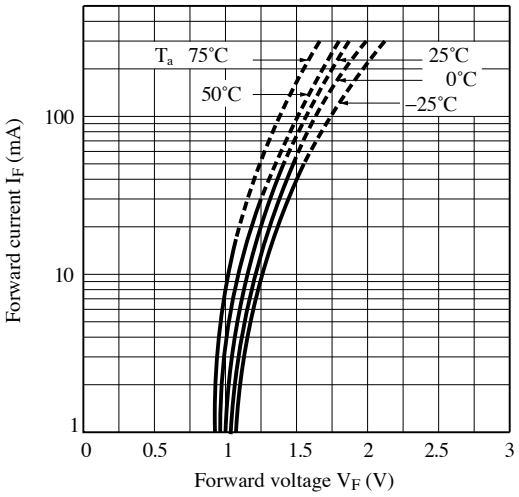
## Fig.1 Forward Current vs. Ambient Temperature



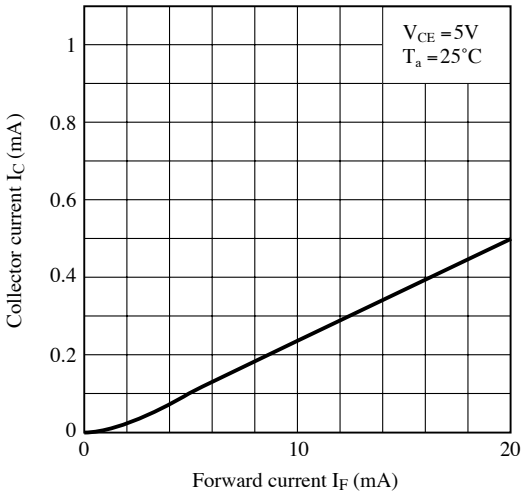

## Fig.2 Power Dissipation vs. Ambient Temperature



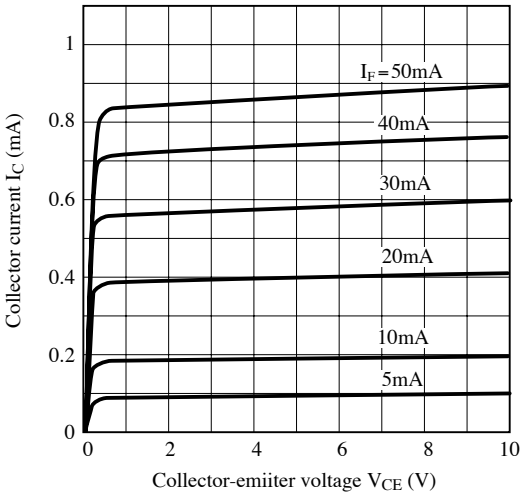

## Fig.3 Forward Current vs. Forward Voltage



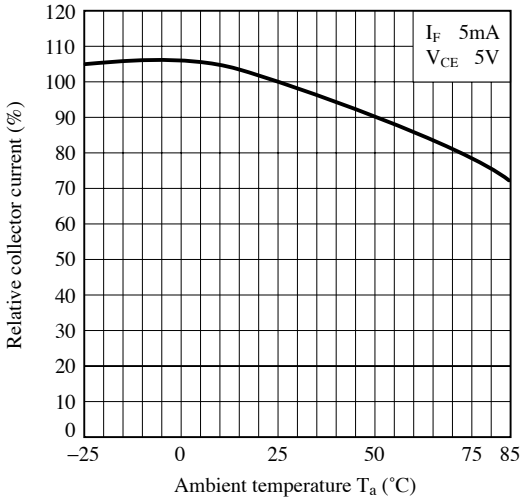

## Fig.4 Collector Current vs. Forward Current



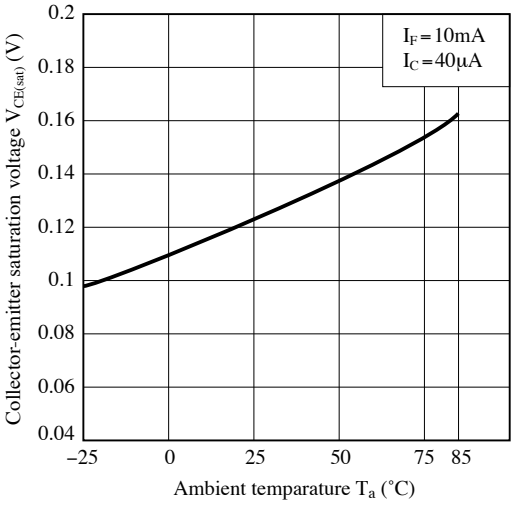

## Fig.5 Collector Current vs. Collector-emitter Voltage



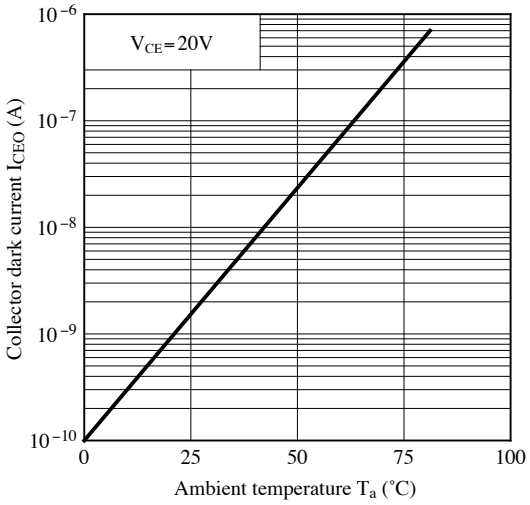

## Fig.6 Relative Collector Current vs. Ambient Temperature



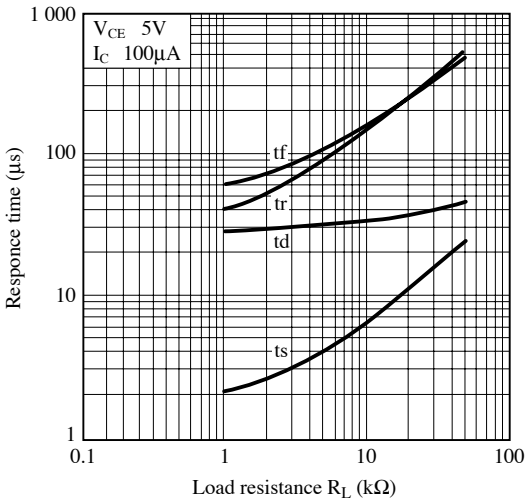
## Fig.7 Collector-emitter Saturation Voltage vs. Ambient Temperature



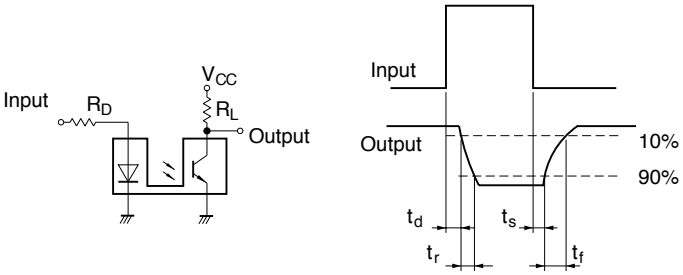

## Fig.8 Collector dark Current vs. Ambient Temperature



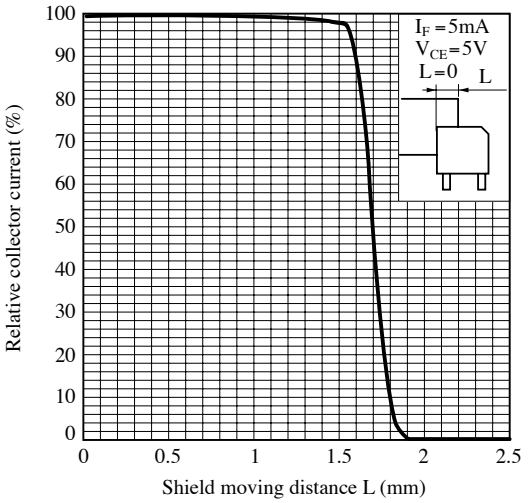

## Fig.9 Response Time vs. Load Resistance



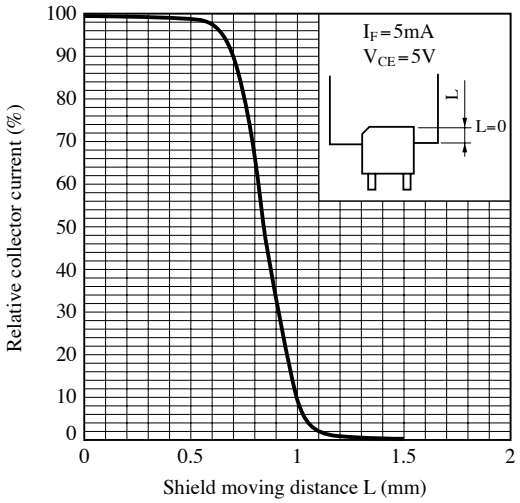

## Fig.10 Test Circuit for Response Time




## Fig.11 Detecting Position Characteristics (1)




## Fig.12 Detecting Position Characteristics (2)



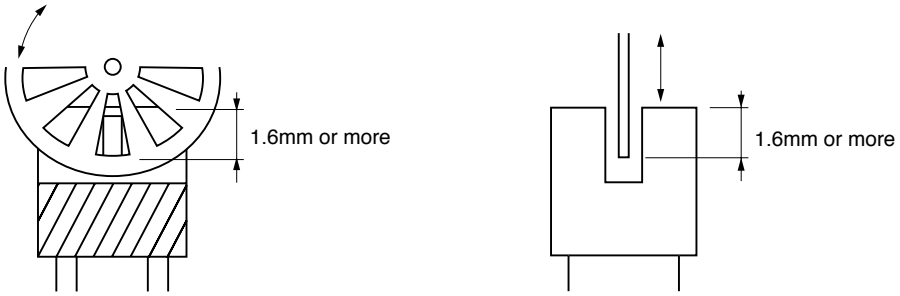

Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

## ■ 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) Position of opaque board
   Opaque board shall be installed at place 1.6mm or more from the top of elements.

(Example)




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)

| Category | Material | Maximum Sensitivity wavelength (nm) | Sensitivity wavelength (nm) | Response time (μs) |
|---|---|---|---|---|
| Phototransistor | 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 polyphernylene sulfide resin (UL94 V-0) | 42Alloy | SnCu plating |

## ■ Manufacturing Guidelines

### ● Soldering Method

#### Flow Soldering:

Soldering should be completed below 260˚C and within 5 s.
Please solder within one time.
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.

#### Hand soldering

Hand soldering should be completed within 3 s when the point of solder iron is below 350˚C.
Please solder within one time.
Please don't touch the terminals directly by soldering iron.
Soldered product shall treat at normal temperature.

#### 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. 50 sleeves in one case.

## ■ Important Notices

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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:

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--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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