

# SHARP

OPTO-ANALOG DEVICES DIVISION  
ELECTRONIC COMPONENTS GROUP  
SHARP CORPORATION

## SPECIFICATION

DEVICE SPECIFICATION FOR

MODEL No.

PHOTOINTERRUPTER

GP1S092HCPIH

REFERENCE

Specified for \_\_\_\_\_

Enclosed please find copies of the Specifications which consists of 14 pages including cover.  
After confirmation of the contents, please be sure to send back  copies of the Specifications  
with approving signature on each.

CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

DATE

BY

10.0

H. Ogura,  
Department General Manager of  
Engineering Dept., III  
Opto-Analog Devices Div.  
ELECOM Group  
SHARP CORPORATION

REFERENCE

Product name : PHOTOINTERRUPTERModel No. : GP1S092HCPIF

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2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.

## (Precautions)

- (1) This product is designed for use in the following application areas ;

|   |   |
|---|---|
| { | · OA equipment    · Audio visual equipment    · Home appliances   |
|   | · Telecommunication equipment (Terminal)    · Measuring equipment |
|   | · Tooling machines    · Computers                                 |

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

- (2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;

|   |   |
|---|---|
| { | · Transportation control and safety equipment (aircraft, train, automobile etc.)      |
|   | · Traffic signals    · Gas leakage sensor breakers    · Rescue and security equipment |
|   | · Other safety equipment  |

- (3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

|   |  |
|---|--|
| { | · Space equipment    · Telecommunication equipment (for trunk lines) |
|   | · Nuclear power control equipment    · Medical equipment             |

- (4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

## 1. Application

This specification applies to the outline and characteristics of transmissive type photointerrupter.

2. Outline Refer to the attached drawing No. CY11279i02.
3. Ratings and characteristics Refer to the attached sheet, Page 4, 5.

## 4. Reliability Refer to the attached sheet, Page 6.

## 5. Outgoing inspection Refer to the attached sheet, Page 7.

## 6. Supplements

### 6.1 Parts Refer to the attached sheet, Page 8.

### 6.2 Packing Refer to the attachment-2-1 to 2-4.

### 6.3 ODS materials

This product shall not contain the following materials.

Also, the following materials shall not be used in the production process for this product.

Materials for ODS : CFCs, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methylchloroform)

### 6.4 Brominated flame retardants

Specific brominated flame retardants such as the PBBOs and PBBs are not used in this device at all.

### 6.5 RoHS restriction

This product does not contain LEAD(Pb) more than RoHS restriction level.

Object : Lead, hexavalent chromium, cadmium, mercury, and two types of brominated flame retardants (PBB, PBDE).

### 6.6 Product mass : Approx. 50mg

## 7. Notes

### 1) Circuit design

In circuit designing, make allowance for the degradation of the light emitting diode output that results from long continuous operation. (50% degradation/5 years)

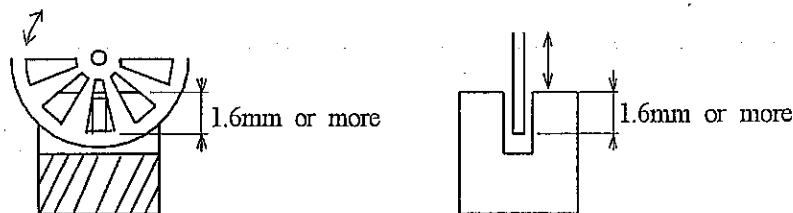
### 2) Prevention of faulty operation

To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

### 3) Position of opaque board

Opaque board shall be installed at place 1.6mm or more from the top of elements.

(Example)



## 4) Soldering

### (1) Solder reflow

Please do only one soldering at the temperature and the time within the temperature profile in attachment-1.

### (2) Soldering by hand

To solder onto lead pins, please solder at 260°C for 5 seconds or less.

And please take care not to let any external force exert on package and lead pins when soldering.

## 5) Cleaning

Cleaning shall be carried out as below to avoid remaining solvent, solder and flux on the device.

### (1) Solvent cleaning : Solvent temperature 45°C or less, Immersion for 3 min or less

### (2) Ultrasonic cleaning : Please don't carry out ultrasonic cleaning.

### (3) The cleaning shall be carried out with solvent below.

Solvent : Ethyl alcohol, Methyl alcohol

## 6) Lead pin

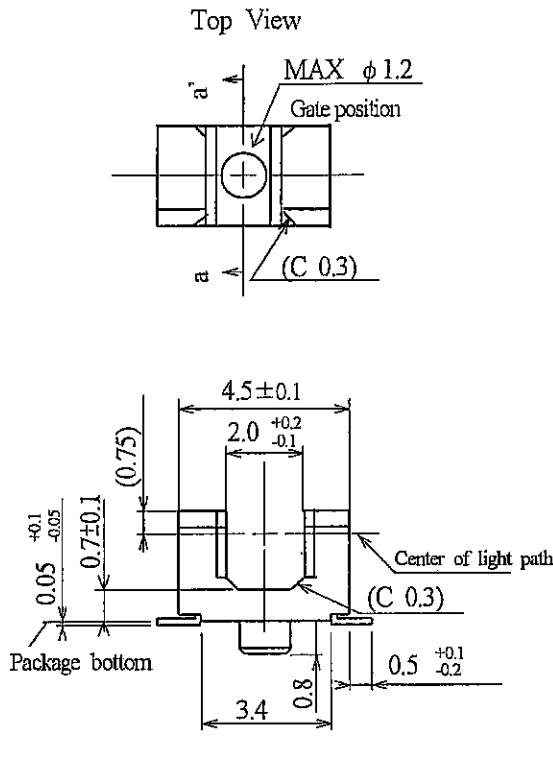
Lead terminals of this product are plated with tin copper alloy. Before usage, please evaluate solderability with actual conditions and confirm. And the uniformity in color for the lead terminals are not specified.

**REFER**

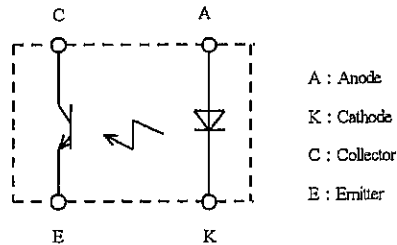
2. Outline Dimensions (Drawing No. CY11279i02)

Scale : 5/1

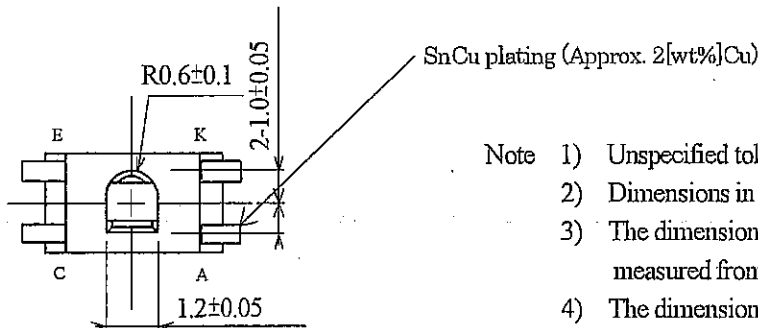
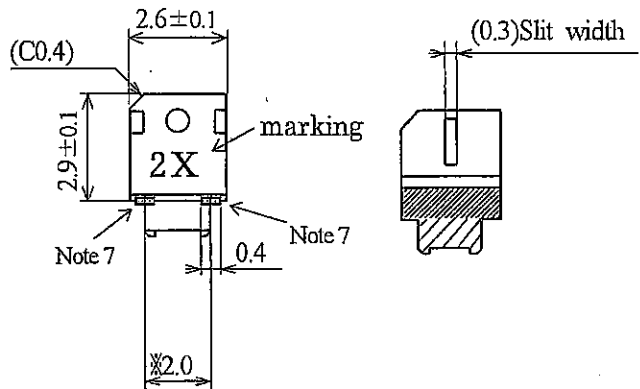
Unit : 1/1mm



Circuit diagram : Top View

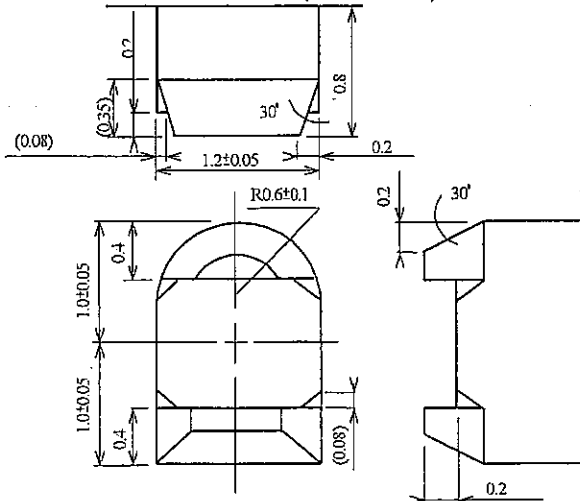


a-a' section



- Note
- 1) Unspecified tolerance shall be  $\pm 0.2$ .
  - 2) Dimensions in parenthesis are shown for reference.
  - 3) The dimensions indicated by  $\otimes$  refer to the those measured from the lead base.
  - 4) The dimensions shown do not include those of burrs.
  - 5) Leads coplanarity  
Difference of distance between package bottom and bottom side of each lead shall be MAX. 0.1.
  - 6) Coplanarity of the boss and gap of the device shall be 0.1.
  - 7) portion : No solder plating.
  - 8) The marking specifications are shown below.

Details of boss dimensions (Scale : Free)



2 X

Production month : Jan. to Sep ; 1 to 9  
Oct.;X, Nov.;Y, Dec.;Z  
Production year : Last digit of production year

3. Ratings and characteristics

3.1 Absolute maximum ratings

$T_a=25^{\circ}\text{C}$

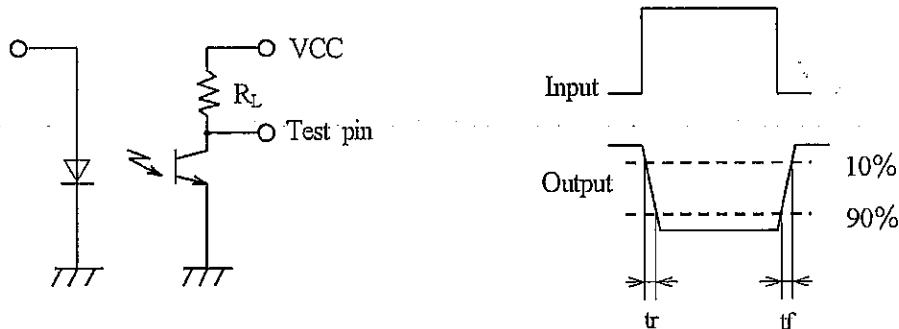
| Parameter               |                             | Symbol    | Rating      | Unit               |
|-------------------------|-----------------------------|-----------|-------------|--------------------|
| Input                   | Forward current             | $I_F$     | 50          | mA                 |
|                         | 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  | $^{\circ}\text{C}$ |
| Storage temperature     |                             | $T_{stg}$ | -40 to +100 | $^{\circ}\text{C}$ |

3.2 Electro-optical characteristics

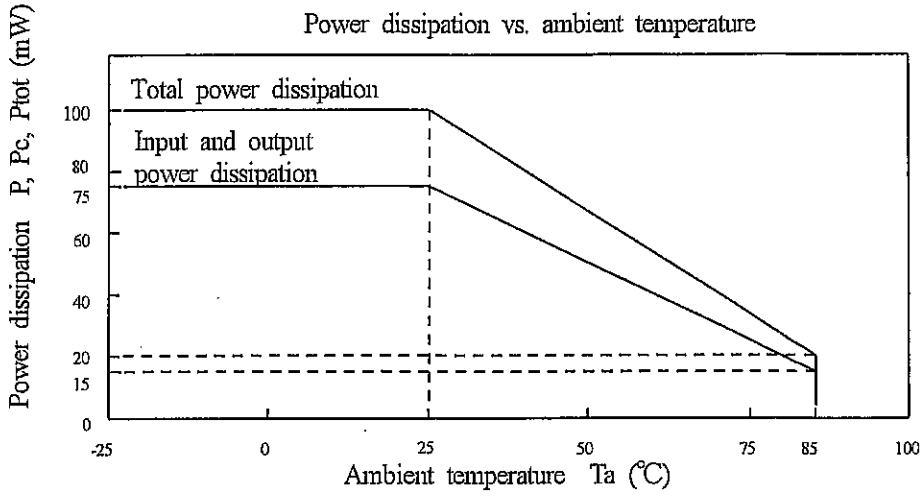
$T_a=25^{\circ}\text{C}$

| Parameter                |                                      | Symbol    | Conditions                         | MIN.                                   | TYP. | MAX. | Unit          |               |
|--------------------------|--------------------------------------|-----------|------------------------------------|--|------|------|---------------|---------------|
| Input                    | Forward voltage                      | $V_F$     | $I_F=20\text{mA}$                  | -                                      | 1.2  | 1.4  | V             |               |
|                          | Reverse current                      | $I_R$     | $V_R=3\text{V}$                    | -                                      | -    | 10   | $\mu\text{A}$ |               |
| Output                   | Collector dark current               | $I_{CEO}$ | $V_{CE}=20\text{V}$                | -                                      | -    | 100  | nA            |               |
| Transfer characteristics | Collector current                    | $I_c$     | $V_{CE}=5\text{V}, I_F=5\text{mA}$ | 100                                    | -    | 400  | $\mu\text{A}$ |               |
|                          | Response time                        | (Rise)    | $t_r$                              | $V_{CE}=5\text{V}, I_c=100\mu\text{A}$ | -    | 50   | 150           | $\mu\text{s}$ |
|                          |                                      | (Fall)    | $t_f$                              | $R_L=1\text{k}\Omega$                  | -    | 50   | 150           | $\mu\text{s}$ |
|                          | Collector-emitter saturation voltage |           | $V_{CE(sat)}$                      | $I_F=10\text{mA}, I_c=40\mu\text{A}$   | -    | -    | 0.4           | V             |

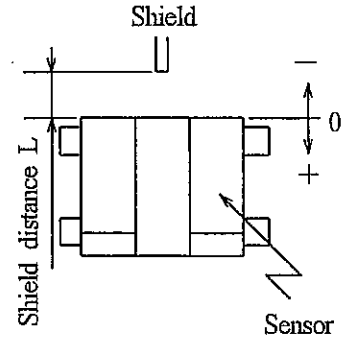
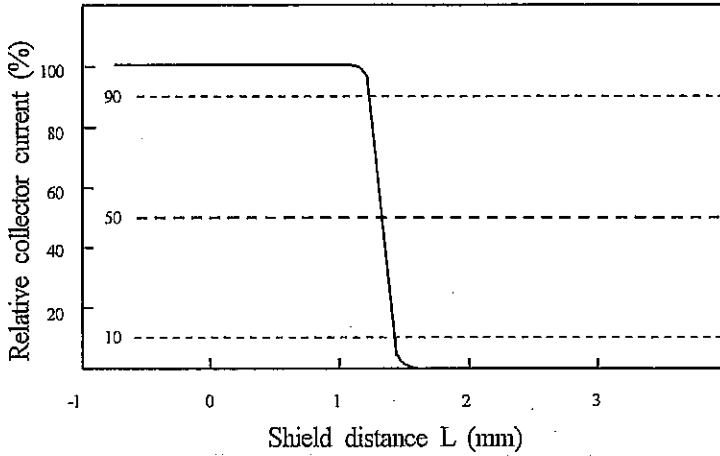
(Test circuit for response time)



**REFERENCE**

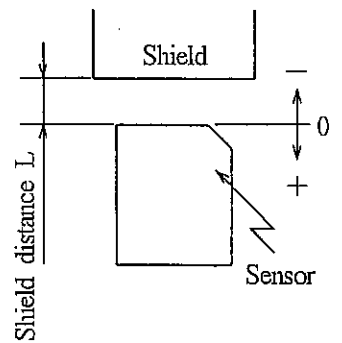
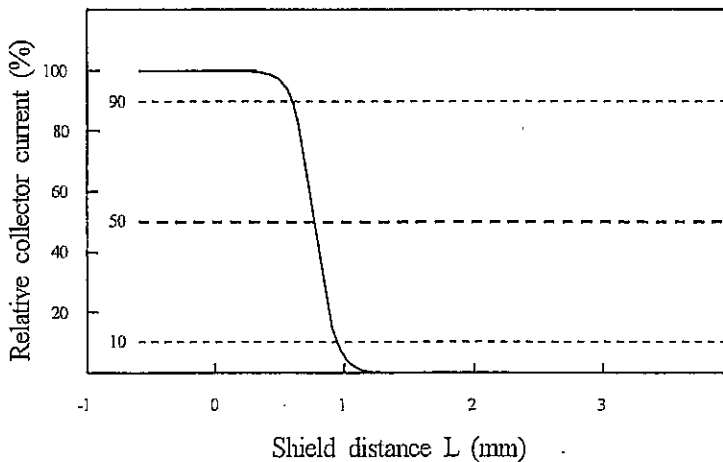


Relative collector current vs. shield distance 1 (Reference value)

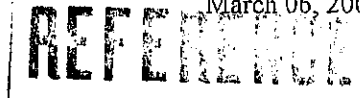


Test condition  
 $I_F=5.0\text{mA}$   
 $V_{CE}=5\text{V}$   
 $T_a=25^\circ\text{C}$

Relative collector current vs. shield distance 2 (Reference value)



Test condition  
 $I_F=5.0\text{mA}$   
 $V_{CE}=5\text{V}$   
 $T_a=25^\circ\text{C}$



4. Reliability

The reliability of products shall satisfy items listed below.

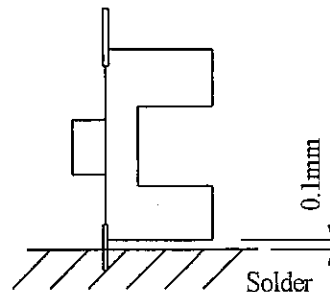
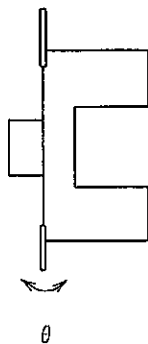
Confidence level : 90%

LTPD : 10 or 20

| Test Items                   | Test Conditions   | Failure Judgement Criteria   | Samples (n)<br>Defective (c) |
|------------------------------|---|--|------------------------------|
| Temperature cycling          | 1 cycle -40°C to +100°C<br>(30min) (30min)<br>20 cycles test  | $I_R \geq U \times 2$<br>$I_{CEO} \geq U \times 2$<br>$V_F \geq U \times 1.2$<br>$I_c \leq L \times 0.8$<br><br>U: Upper specification limit<br>L: Lower specification limit | n=22, c=0                    |
| humidity storage             | +60°C, 90%RH, 500h  |  | n=22, c=0                    |
| High temp. storage           | +100°C, 500h  |  | n=22, c=0                    |
| Low temp. storage            | -40°C, 500h   |  | n=22, c=0                    |
| Operation life               | $I_F=20mA$ , $T_a=25^\circ C$ , 500h  |  | n=22, c=0                    |
| Mechanical shock             | 15000m/s <sup>2</sup> , 0.5ms<br>3 times/ $\pm X, \pm Y, \pm Z$ direction   |  | n=11, c=0                    |
| Variable frequency vibration | 100 to 2000 to 100Hz/20min<br>2h/ $X, Y, Z$ direction<br>100m/s <sup>2</sup>  |  | n=11, c=0                    |
| Terminal strength (Tension)  | Weight: 3N<br>30s/each terminal   |  | n=11, c=0                    |
| Terminal strength (Bending)  | Weight: 1N<br>$0^\circ \rightarrow 90^\circ \rightarrow 0^\circ \rightarrow -90^\circ \rightarrow 0^\circ$<br>1time bending |  | n=11, c=0                    |
| Soldering heat               | 260°C, 5s   | n=11, c=0  |                              |
| Solderability                | 245°C, 5s<br>Prior disposition: Dip rogin flux.<br>Then immerse up to 0.1mm from the bottom face of package.                | Judgement only appearance<br>Solder shall adhere at less than 95% area of immersed portion of lead.  | n=11, c=0                    |
| Solder reflow                | Refer to the attached sheet-1. 1 time   | $I_c < L \times 0.8$   | n=22, c=0                    |

\* Terminal bending direction is shown below.

\* Soldering area is shown below.



\* The alloy composition of solder used for lead free should be Sn-2.5Ag-1Bi-0.5Cu or Sn-3.0Ag-0.5Cu. Flux used for precleaning should be equivalent to EC-19S(TAMURA KAKEN CORPORATION).

5. Outgoing inspection

5.1 Inspection items

- (1) Electrical characteristics  
 $V_F, I_R, BV_{BCO}, BV_{CEO}, I_c, I_{CEO}, V_{CE(sat)}$
- (2) Appearance

5.2 Sampling method and Inspection level

A single sampling plan, normal inspection level II based on ISO 2859 is applied.  
 The AQL according to the inspection items are shown below.

| Defect       | Inspection item                             | AQL (%) |
|--------------|---|---------|
| Major defect | Characteristics defect                      | 0.065   |
| Minor defect | Defects on appearance except shown above. * | 0.25    |

\* Crack ... Visible crack shall be defect.

Split

\* Chip ... One which affects the electrical characteristics shall be defect.

Scratch

The others



**REFERENCE**

## 6. Supplements

## 6.1 Parts

This product uses the below parts.

## 6.1.1 Light detector (Quantity : 1)

| Type             | Material        | Maximum sensitivity<br>(nm) | Sensitivity<br>(nm) | Response time<br>( $\mu$ s) |
|------------------|-----------------|-----------------------------|---------------------|-----------------------------|
| Phototran-sistor | Silicon<br>(Si) | 930                         | 700 to 1200         | 20                          |

## 6.1.2 Light emitter (Quantity : 1)

| Type  | Material | Maximum light emitting<br>wavelength (nm) | I/O Frequency<br>(MHz) |
|---|----------|---|------------------------|
| Infrared light emitting diode<br>(non-coherent) | GaAs     | 950                                       | 0.3                    |

## 6.1.3 Material

| Case                         | Lead frame | Lead frame plating |
|------------------------------|------------|--------------------|
| Black PPS resin<br>(UL94V-0) | 42 Alloy   | SnCu plating       |

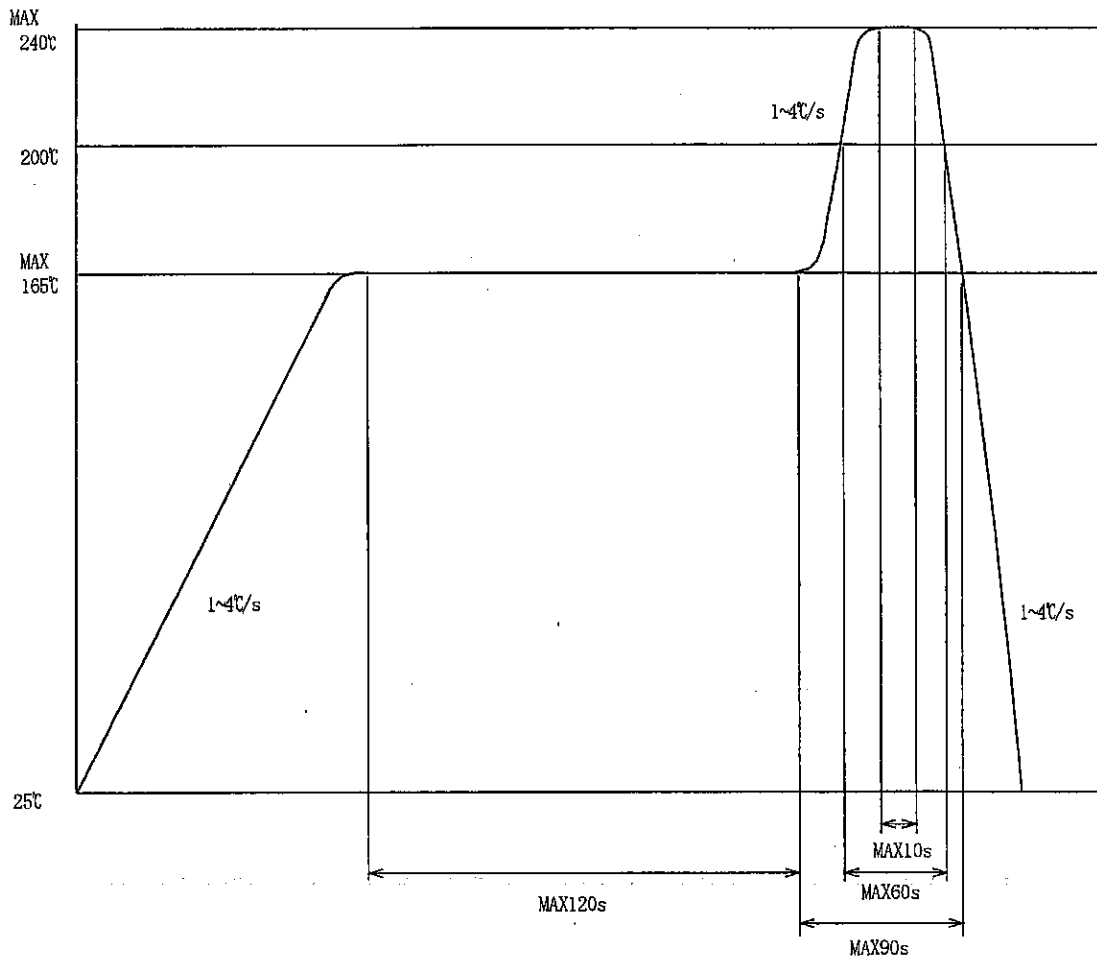
## 6.1.4 Others

This product shall not be proof against radiation flux.

Precautions for Soldering photointerrupter

1. In case, solder reflow

Please do only one soldering at the temperature and the time within the temperature profile as shown in the figure below.



2. Other precautions

An infrared lamp used to heat up for soldering may cause a localized temperature rise in the resin. So keep the package temperature within that specified in Item 1.

Also avoid immersing the resin part in the solder.

Even if within the temperature profile above, there is the possibility that the gold wire in package is broken in case that the deformation of PCB gives the affection to lead pins.

Please use after confirmation the conditions fully by actual solder reflow machine.

Package specifications (  $\phi$  330mm reel)

1. Application

This specification applies to the taping specifications and the relation items for the GP1S092HCPIF.

2. Taping method

(2.1) Tape structure and Dimensions (Refer to the attached sheets-2-2)

The tape shall have a structure in which a cover tape is sealed heat-pressed on the carrier tape made by polystyrene to protect against static electricity.

(2.2) Reel structure and Dimensions (Refer to the attached sheets-2-3)

The taping reel material shall be polystyrene with its dimensions as shown in the attached drawing.

(2.3) Direction of product insertion (Refer to the attached sheets-2-3)

Product direction in carrier tape shall direct to the detector at the hole side on the tape.

3. Adhesiveness of cover tape

The exhalation force between carrier tape and cover tape shall be 0.2N to 1.0N for the angle from 160° to 180° .

4. Rolling method and quantity

Wind the tape back on the reel so that the cover tape will be outside the tape.

Attach more than 20cm of blank tape to the trailer and the leader of the tape and fix the both ends with adhesive tape.

One reel shall contain 2000 pcs.

5. Marking

The outer packaging case shall be marked with following information.

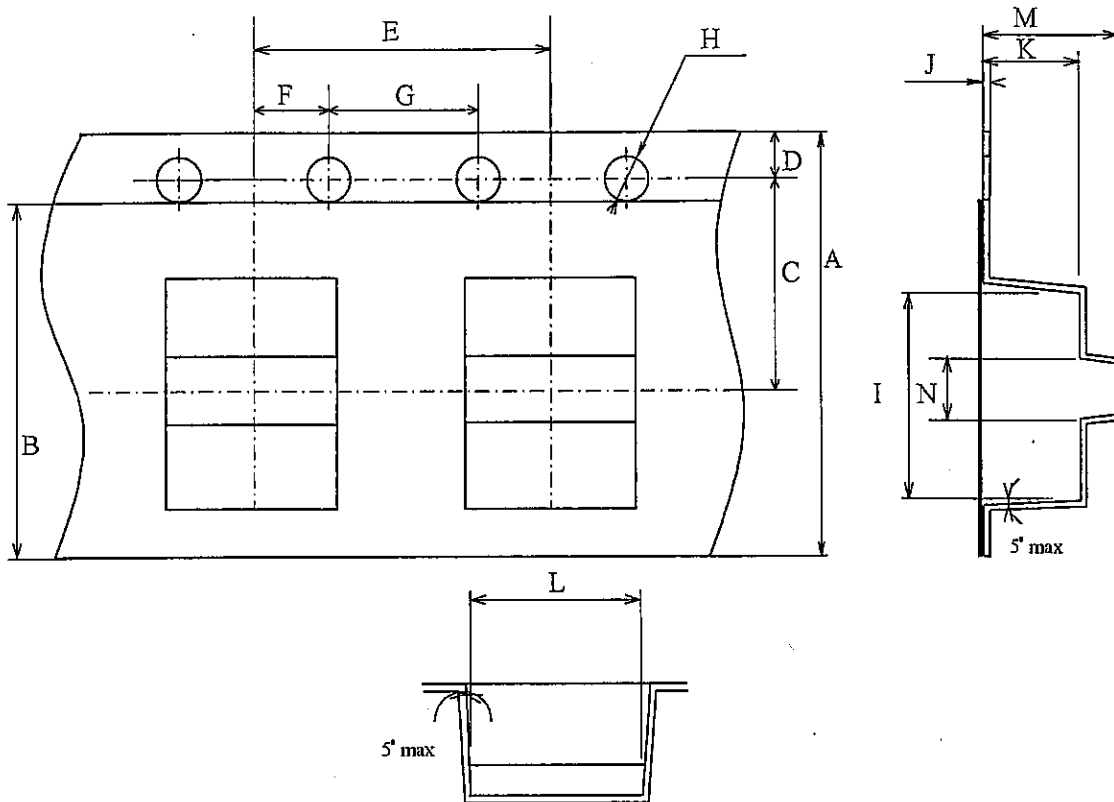
\* Model No.      \* Number of pieces delivered      \* Production date

6. Safety protection during shipping

There shall be no deformation of component or degradation of electrical characteristics due to shipping.

**REFERENCE**

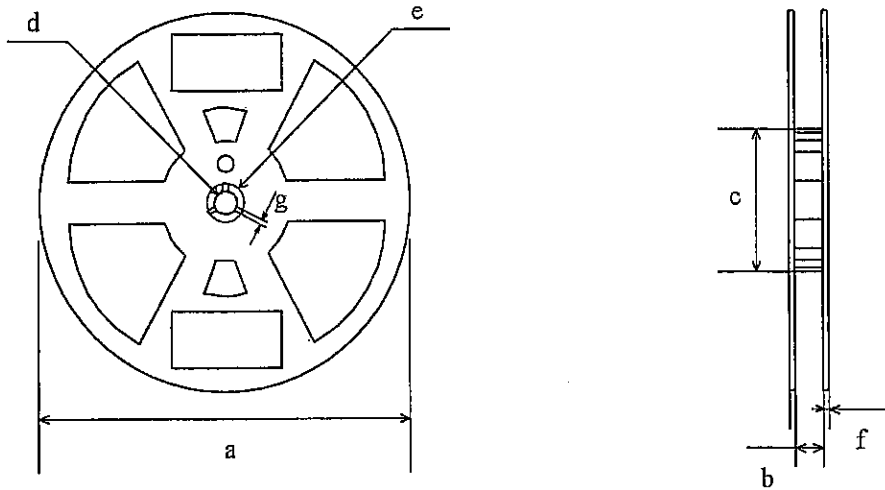
Tape structure and Dimensions



| Symbol | A                    | B                       | C                    | D                    | E                   | F                    | G                   | H                        |
|--------|----------------------|-------------------------|----------------------|----------------------|---------------------|----------------------|---------------------|--------------------------|
| Unit   |                      |                         |                      |                      |                     |                      |                     |                          |
| mm     | 12.0 <sup>±0.3</sup> | 9.5 <sup>±0.3/0.2</sup> | 5.5 <sup>±0.05</sup> | 1.75 <sup>±0.1</sup> | 8.0 <sup>±0.1</sup> | 2.0 <sup>±0.05</sup> | 4.0 <sup>±0.1</sup> | φ1.5 <sup>±0.1/0.0</sup> |

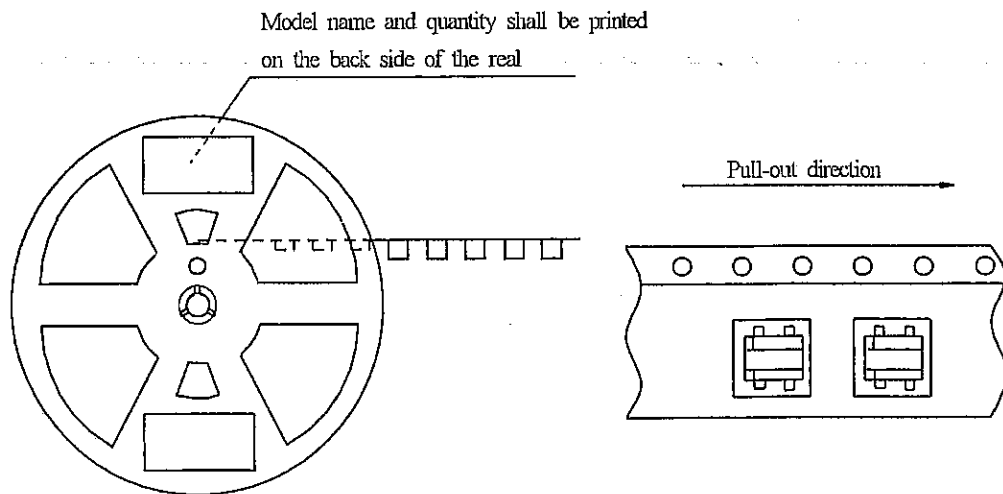
| Symbol | I                   | J                    | K                   | L                   | M                   | N                    |
|--------|---------------------|----------------------|---------------------|---------------------|---------------------|----------------------|
| Unit   |                     |                      |                     |                     |                     |                      |
| mm     | 6.1 <sup>±0.1</sup> | 0.4 <sup>±0.05</sup> | 3.2 <sup>±0.1</sup> | 2.8 <sup>±0.1</sup> | 4.3 <sup>±0.1</sup> | 1.45 <sup>±0.1</sup> |

Reel structure and Dimensions



| Symbol<br>Unit | Check word |      |      |        |        |         |         |
|----------------|------------|------|------|--------|--------|---------|---------|
|                | a          | b    | c    | d      | e      | f       | g       |
| mm             | 330±1      | 13±1 | 80±1 | 13±0.5 | 21±1.0 | 2.0±0.5 | 2.0±0.5 |

Direction of product insertion



**REFERENCE**

Moisture-proof package specification ( φ 330mm reel)

1. Application

This specification applies to the products which Sharp delivers to customer.

2. Packaging specifications

2.1 Packaging material

| Name                    | Material              | Quantity     | Aim                                  |
|-------------------------|-----------------------|--------------|--------------------------------------|
| Aluminum laminated sack | Aluminum polyethylene | Refer to 2.2 | Moisture-proof                       |
| Label                   | Paper(-made)          | -            | Indication of Model No. and Quantity |

2.2 Packaging method

- (1) Seal the aluminum laminated bag included the ruled tape-reel quantity.
- (2) Fill up the blank of label and paste on the bag.
- (3) Put the moisture-proof laminated bag in the ruled case (5 bag/case).

| Package shape        | Product   | Quantity      | Moisture-proof sack Quantity |
|----------------------|-----------|---------------|------------------------------|
| Tape-reel ( φ 330mm) | 1ch. type | 2000pcs./reel | 1reel/bag                    |

Minimum order Quantity : 1 reel/bag

2.3 Regular packing mass

(Excluding fractions, however above packing material, packing count, packing style)

Product mass : Approx. 2.6kg

3. Storage and management after open

3.1 Storage condition : Storage shall be in accordance with the below conditions.

Storage temp. : 5 to 30°C

Storage humidity : 70%RH or less

3.2 Treatment after open

- (1) After open, please mount at the conditions of humidity 60%RH or less and temperature 5 to 25°C within 4 days.
- (2) In case of long time storage after open, please mount at the conditions of humidity 70%RH or less and temperature 5 to 30°C within 2 weeks by using dry box or resealing with desiccant in moisture-proof bag by sealer.

3.3 Baking before mounting

In case that it could not carry out the above treatment, it is able to mount by baking treatment.

However baking treatment shall be limited only 1 time.

Recommended conditions : 125°C, 16 to 24 hours

※ Baking treatment can not carry out at the packaged state.

Please carry out baking at the state of mounting on PCB or getting on the metal tray.