

SHARP

REFERENCE
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OPTO-ELECTRONIC DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

PHOTOINTERRUPTER

MODEL No.

GP2S60 series

Specified for _____

Enclosed please find copies of the Specifications which consists of 15 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-Electronic Devices Div.
ELECOM Group
SHARP CORPORATION

REFERENCE

Product name : PHOTOINTERRUPTER

Model No. : GP2S60 series

| | |
|--|-----------|
| | Model No. |
| | GP2S60 |
| | GP2S60A |
| | GP2S60B |

1. These specification sheets include materials protected under copyright of Sharp Corporation ("Sharp"). Please do not reproduce or cause anyone to reproduce them without Sharp's consent.
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 ;

| | | |
|--|---|--|
| <ul style="list-style-type: none"> · OA equipment · Telecommunication equipment (Terminal) · Tooling machines | <ul style="list-style-type: none"> · Audio visual equipment · Telecommunication equipment (Terminal) · Computers | <ul style="list-style-type: none"> · Home appliances · Measuring equipment |
|--|---|--|

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 ;

| | |
|--|--|
| <ul style="list-style-type: none"> · Transportation control and safety equipment (aircraft, train, automobile etc.) · Traffic signals · Other safety equipment etc. | <ul style="list-style-type: none"> · Gas leakage sensor breakers · Rescue and security equipment |
|--|--|
- (3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

| | |
|--|---|
| <ul style="list-style-type: none"> · Space equipment · Nuclear power control equipment | <ul style="list-style-type: none"> · Telecommunication equipment (for trunk lines) · Medical equipment etc. |
|--|---|
- (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 reflective type photointerrupter, Model No. GP2S60.
2. Outline
Refer to the attached drawing No. CY9710i02.
3. Ratings and characteristics
Refer to the attached sheet, Page 6 to 8.
4. Reliability
Refer to the attached sheet, Page 9.
5. Outgoing inspection
Refer to the attached sheet, Page 10.
6. Supplements
 - 6.1 Parts : Refer to the attached sheet, Page 11.
 - 6.2 Package : Refer to the attached sheet-2-1 to 2-4.
- 6.3 Device delivery shall be delivered model that has "○" marking in the rank table below.
However, in case of GP2S60 with no rank limitation, the quantity of each rank shall not be prescribed.

Collector current (Ic) rank table

| Rank at delivery | Model No. | Ic (μA) | Rank | |
|------------------|-----------|-----------|------|---|
| | GP2S60 | 40 to 130 | AorB | Test conditions V _{CE} =2V I _F =4mA T _a =25°C |
| | GP2S60A | 40 to 80 | A | |
| | GP2S60B | 65 to 130 | B | |

- 6.4 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)
- 6.5 Brominated flame retardants
Specific brominated flame retardants such as the PBBOs and PBBs are not used in this device at all.
- 6.6 Product mass : Approx. 0.01g
7. Notes
 - 1) Before the 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) Regarding to prevention of malfunction
To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.
 - 3) Distance characteristics
The distance between the photointerrupter and the object to be detected shall be determined the distance by referencing attached graph "Relative collector current vs. distance"..
 - 4) For 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.
 - (3) Regarding amount of solder, if there is solder leakage in terminal wiring pattern between PCB and housing main body, the reliability will be deteriorated.
Please check the proper amount of solder in advance not to have solder leakage into terminal wiring pattern between PCB and housing main body.
 - 5) For cleaning
Cleaning shall carry out as the below items to avoid keeping 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 , Isopropyl alcohol

6) For wiring on a mounting PCB

To avoid possibility for short, please do not apply pattern wiring on the back side of the device.

7) Regarding to mounting this product

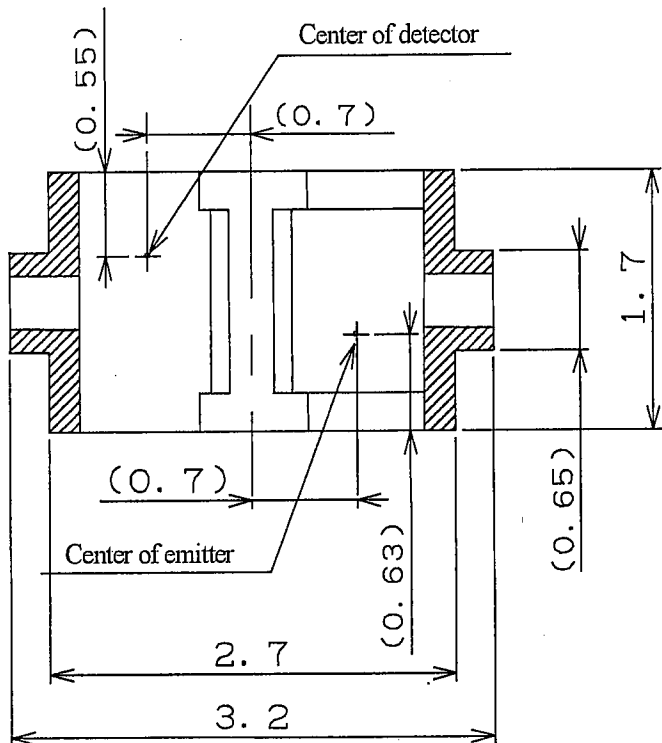
There is a possibility that the opaque molded resin portion may have a crack by force at mounting etc.

Please use this product after well confirmation of conditions in your production line.

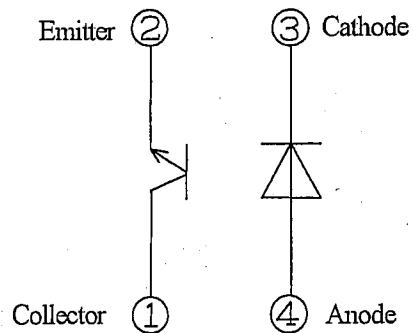
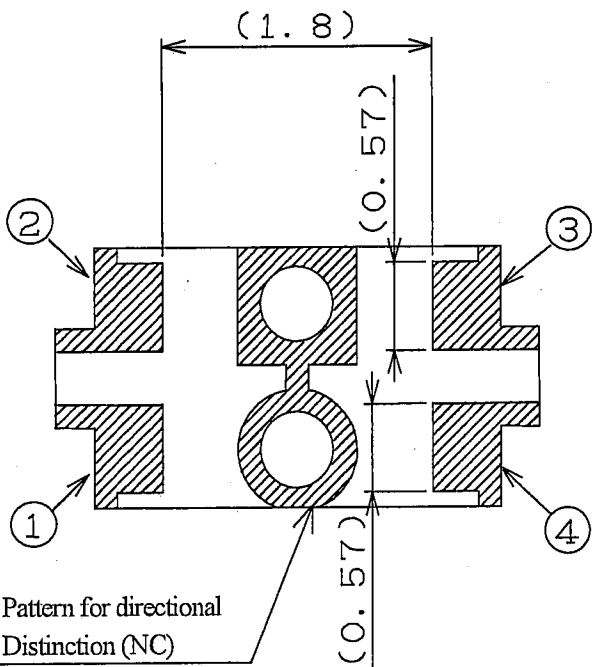
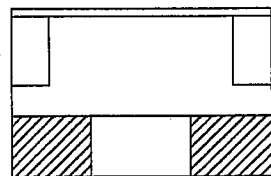
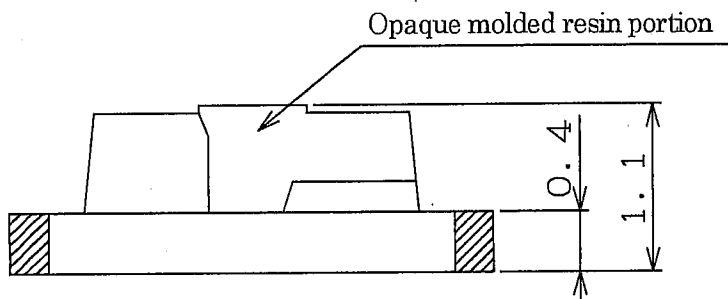
2. Outline Dimensions (Drawing No. CY9710i02)

Scale : 20/1

Unit : 1/1mm

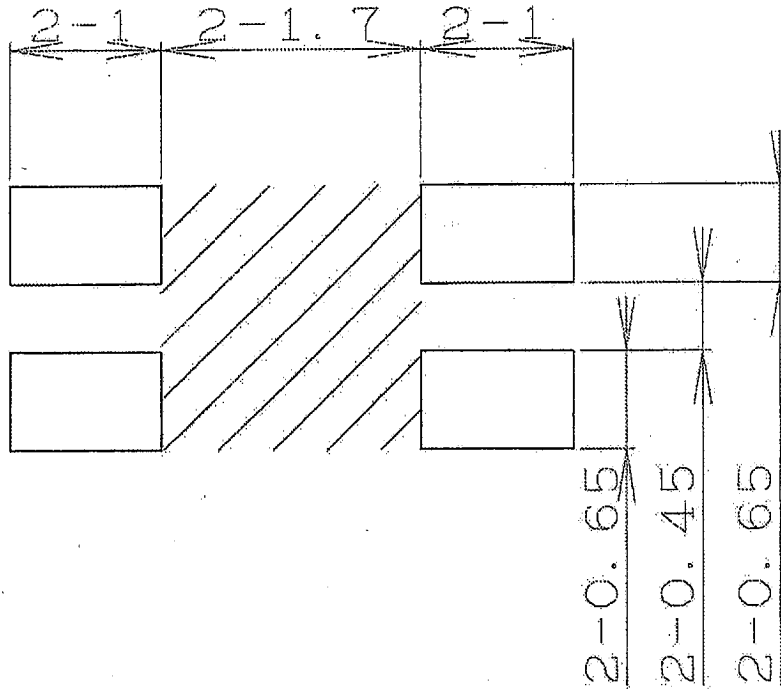



- 1) Unspecified tolerance shall be ± 0.15 mm.
- 2) Dimensions in parenthesis are shown for reference.
- 3) Dimensions on the outline drawing is the maximum value excluding burr.
The maximum dimension of burr which goes over the area of $(3.2 \times 1.7 \times 1.1)$ shall be ± 0.15 .
- 4) : Au plating area
- 5) Internal connection diagram is shown below.



Recommended pattern drawing Scale : 20/1 Unit : 1/1mm

Note 1) Unspecified tolerances shall be ± 0.1 .



 area : To avoid possibility for short, please do not apply pattern wiring

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=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 |
| | * Soldering temperature | T _{sol} | 260 | °C |

* Soldering time : 5 s or less

3.2 Electro-optical characteristics

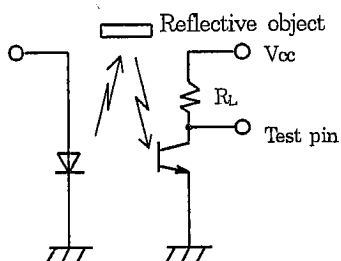
Ta=25°C

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit | |
|--------------------------|------------------------|------------|----------------------|---------------------------|------|------|---------|---------|
| Input | Forward voltage | V_F | $I_F=20mA$ | - | 1.2 | 1.4 | V | |
| | Reverse current | I_R | $V_R=6V$ | - | - | 10 | μA | |
| Output | Collector dark current | I_{CEO} | $V_{CE}=20V$ | - | 1 | 100 | nA | |
| Transfer characteristics | *1 Collector current | I_c | $V_{CE}=2V, I_F=4mA$ | 40 | 85 | 130 | μA | |
| | *2 Leak current | I_{LEAK} | $V_{CE}=2V, I_F=4mA$ | - | - | 500 | nA | |
| | *3 Response time | (Rise) | t_r | $V_{CE}=2V, I_c=100\mu A$ | - | 20 | 100 | μs |
| | | (Fall) | t_f | $RL=1k\Omega, d=1mm$ | - | 20 | 100 | μs |

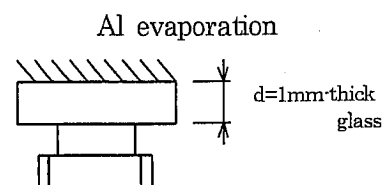
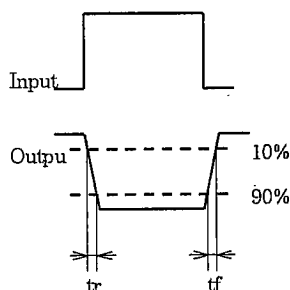
- *1 The conditions and arrangement of the reflective object are shown below.
- *2 Without reflective object
- *3 d : Glass thickness of reflective mirror

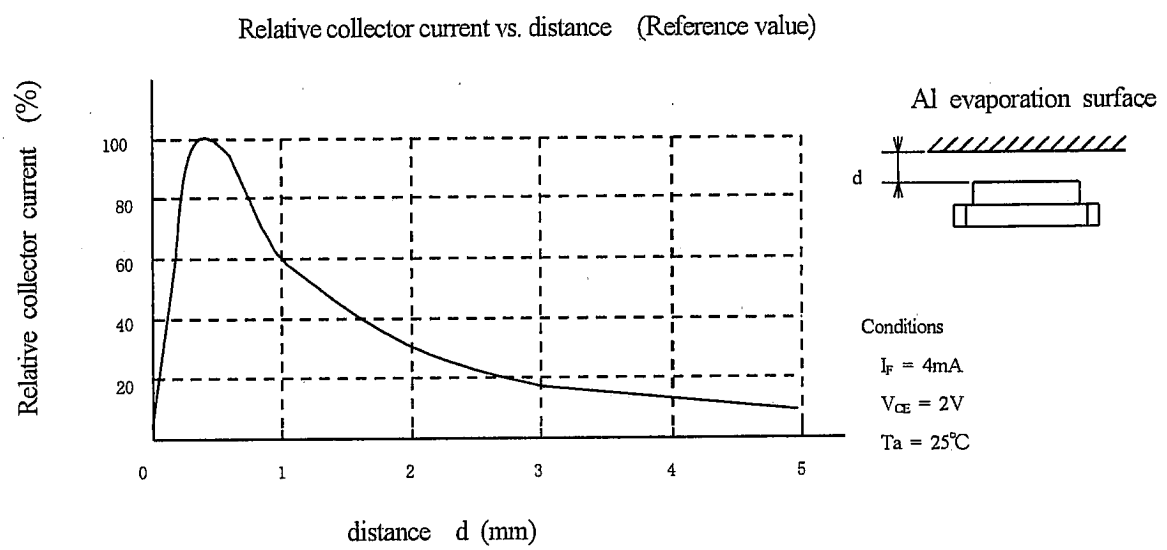
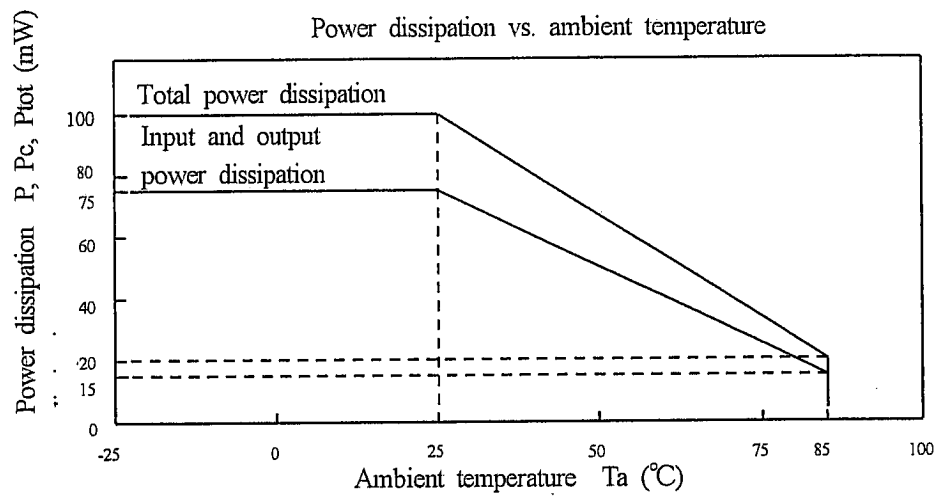
| Rank | Collector current I_c (μA) |
|------|-------------------------------------|
| - | 40 to 130 |
| A | 40 to 80 |
| B | 65 to 130 |

(Test circuit for response time)



(Test arrangement for collector current)





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) Defective (c) |
|------------------------------|--|--|------------------------------|
| Temperature cycling | 1 cycle -40°C to +100°C (30min) (30min) 20 cycles test | $V_F \geq U \times 1.2$ $I_c \leq L \times 0.8$ $I_{LEAK} \geq U \times 2$ $I_R \geq U \times 2$ $I_{CEO} \geq U \times 2$ U: Upper specification limit 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 | IF=50mA, Ta=25°C Ptot=100mW, 500h | | n=22, c=0 |
| Mechanical shock | 15km/s ² , 0.5ms 3 times/±X, ±Y, ±Z direction | | n=11, c=0 |
| Variable frequency vibration | 100 to 2000 to 100Hz/20min 100m/s ² , 2h/X, Y, Z direction | | n=11, c=0 |
| Solder reflow | Refer to the attachment-1. 1 time | $I_c < L \times 0.8$ | n=22, c=0 |

5. Outgoing inspection

5.1 Inspection items

- (1) Electrical characteristics
 $V_F, I_R, BV_{ECO}, BV_{CEO}, I_C, I_{CEO}$
- (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 | Inspection level | AQL (%) |
|--------------|---|----------------------|---------|
| Major defect | Characteristics defect | Normal inspection II | 0.065 |
| Minor defect | Defects on appearance except shown above. * | Normal inspection II | 0.25 |

* Crack ... Visible crack shall be defect.

| | | |
|--|---|---|
| <ul style="list-style-type: none"> Split * Chip Scratch The others | } | ... One which affects the electrical characteristics shall be defect. |
|--|---|---|

6. Supplements

6.1 Parts

This product uses the below parts.

6.1.1 Light detector (Q'ty : 1)

| Type | Material | Maximum sensitivity (nm) | Sensitivity (nm) | Response time (µs) |
|------------------|--------------|--------------------------|------------------|--------------------|
| Phototran-sistor | Silicon (Si) | 930 | 700 to 1200 | 20 |

6.1.2 Light emitter (Q'ty : 1)

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

6.1.3 Material

| Case | PCB | Lead frame plating |
|----------------------------------|-------------------|--------------------|
| Epoxy resin Black epoxy resin | Grass epoxy resin | Au plating |

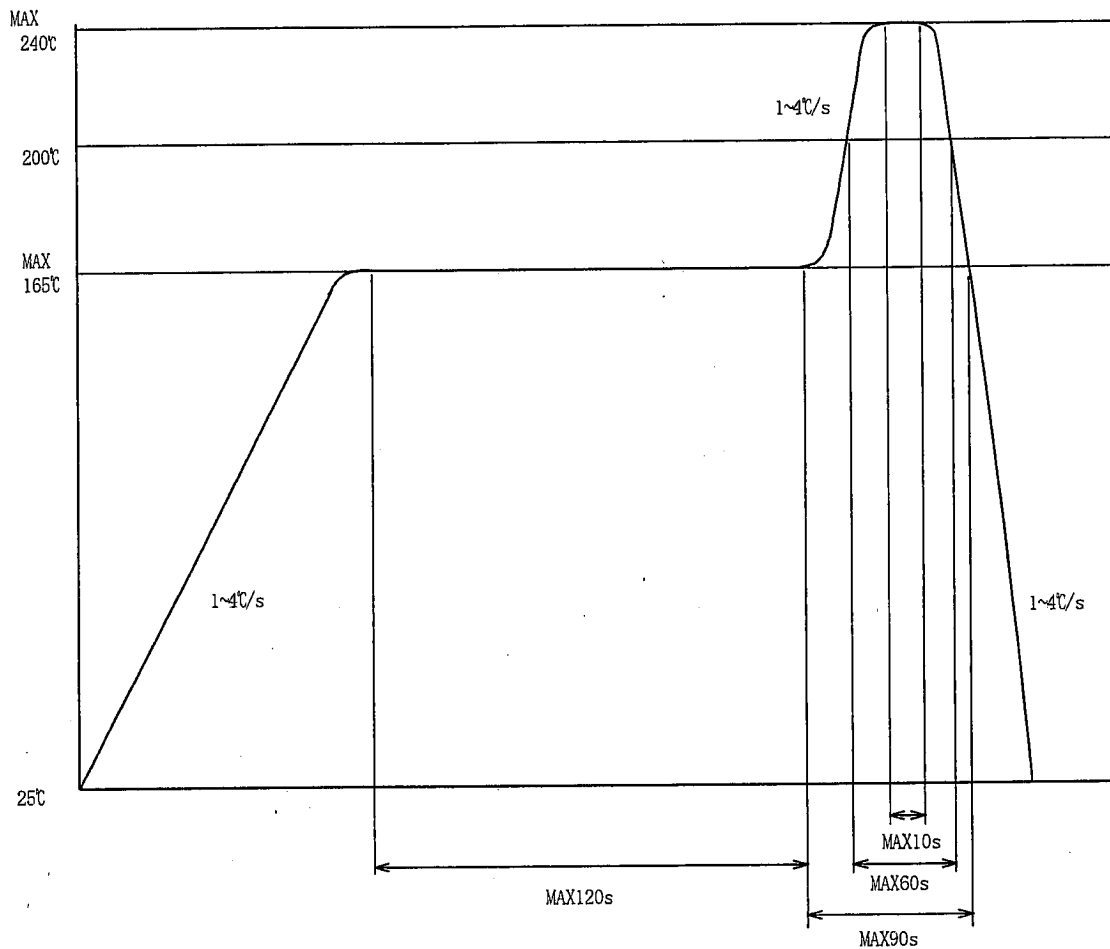
6.1.4 Others

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 (ϕ 180mm reel)

1. Application

This specification applies to the taping specifications and the relation items for the GP2S60.

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 PS to protect against static electricity.

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

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

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

3. Method of incomplete seal

In case of repair taped failure devices, cut a surface of cover tape at three side of square hole on carrier tape by cutter, and after replacing to good devices, the cut portion shall be sealed with adhesive tape.

4. 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°.

5. Rolling method and quantity

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

Attach more than 25cm 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.

6. Marking

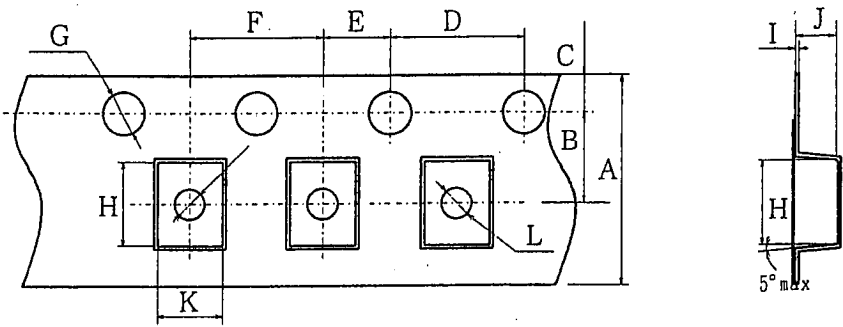
The outer packaging case shall be marked with following information.

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

7. Safety protection during shipping

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

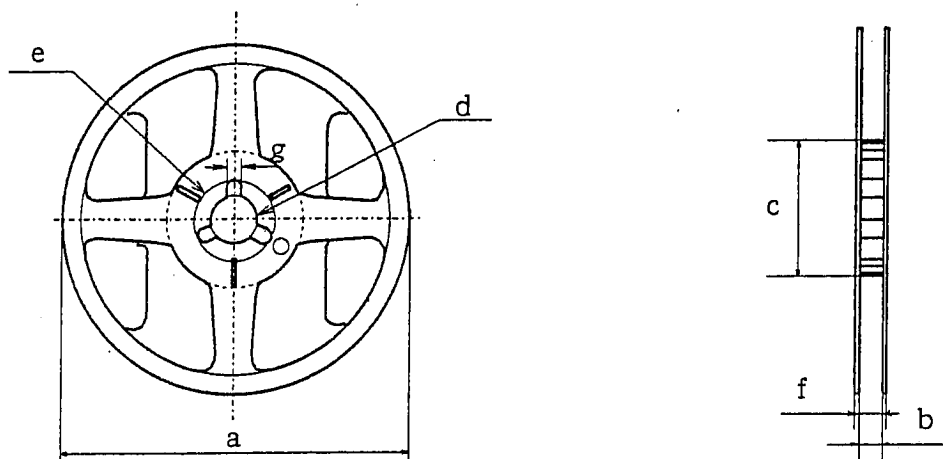
Tape structure and Dimensions



| Symbol | A | B | C | D | E | F |
|--------|-------------|--------------|--------------|-------------|-------------|-------------|
| Unit | | | | | | |
| mm | ±0.3 8.0 | ±0.05 3.5 | ±0.1 1.75 | ±0.1 4.0 | ±0.1 2.0 | ±0.1 4.0 |

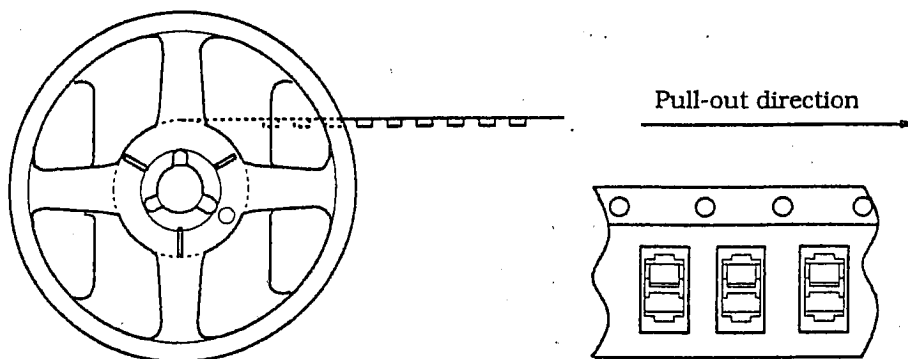
| Symbol | G | H | I | J | K | L |
|--------|-----------------|-------------|--------------|--------------|-------------|---------------|
| Unit | | | | | | |
| mm | ±0.05 φ 1.55 | ±0.1 3.6 | ±0.05 0.3 | ±0.1 1.25 | ±0.1 2.2 | ±0.1 φ 1.1 |

Reel structure and Dimensions



| Symbol Unit | Check word | | | | | | |
|----------------|------------|-----|----------------------------------|--------|--------|----------|---------------------------------|
| | a | b | c | d | e | f | g |
| mm | 180 | 9±1 | 60 ^{+0.5} ₋₀ | 13±0.2 | 21±0.8 | 11.4±1.0 | 2 ^{+0.3} ₋₀ |

Direction of product insertion



Moisture-proof package specification (φ180mm reel)

1. Application

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

2. Packaging specifications

2.1 Packaging material

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

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 | Q'ty | Moisture-proof sack Q'ty |
|--------------------|-----------|---------------|--------------------------|
| Tape-reel (φ180mm) | 1ch. type | 2000pcs./reel | 1reel/bag |

Minimum order Q'ty : 1 reel/bag

2.3 Regular packing mass

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

Product mass : Approx. 790g

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