

REFERENCE

SPEC. No. ED-05G081
ISSUE December 3, 2007

SHARP

OPTO- ANALOG DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

PHOTOINTERRUPTER

MODEL No.

GP1S195HCZSF

Specified for

Enclosed please find copies of the Specifications which consists of 13 pages including cover.
After confirmation of the contents, please be sure to send back copy of the Specifications
with approving signature on each.

CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

DATE

BY

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

REFERENCE

Product name : PHOTOINTERRUPTER

Model No. : GP1S195HCZSF

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 ;

• 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; Model No. GP1S195HCZSF.

2. Outline : Refer to the attached drawing No. CY13002i02.

3. Ratings and characteristics : Refer to the attached sheet, Page 5, 6, 7.

4. Reliability : Refer to the attached sheet, Page 8.

5. Outgoing inspection : Refer to the attached sheet, Page 9.

6. Supplements

6.1 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 : CFC_s, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methyl chloroform)

6.2 Specified brominated flame retardants

Specified brominated flame retardants (PBB and PBDE) are not used in this device at all.

6.3 Compliance with each regulation

6.3.1 The RoHS directive(2002/95/EC)

This product complies with the RoHS directive(2002/95/EC) .

Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

6.3.2 Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic Information Products Regulation (Chinese : 电子信息产品污染控制管理办法).

Category	Toxic and hazardous substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr ⁶⁺)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Photointerrupter	✓	✓	✓	✓	✓	✓

✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006 standard .

6.4 Product mass : Approx. 22mg

6.5 Packing : Refer to the attached drawing No. CY13003i09B.

7. Notes

7.1 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)

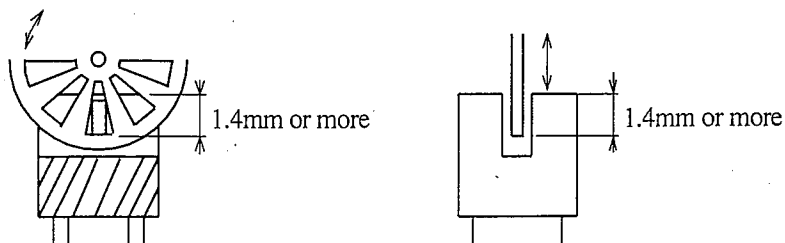
7.2 Prevention of detection error

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

7.3 Position of opaque board

Opaque board shall be installed at place 1.4mm or more from the top of elements.

(Example)



7.4 Print circuit board design

Because a portion of the internal lead may be exposed at the back of the product, please consider it in the pattern design for a print circuit board design.

7.5 Soldering

(1) Reflow soldering

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

(2) Hand soldering

To solder onto lead pins, please iron ahead temperature at 260°C for 3 seconds or less.

Please also take care not to let mechanical stress exert on package and lead pins when soldering.

Please have soldering adjustment, etc. after GP1S195HCZSF is cooled down, and also note that the outer mold resin may be meltdown by heating for a long time.

In case that a soldering iron touches its package directly or in case that position adjustment on PWB is required, the solder at the 4 pins must be melt for repairing by using a hot plate set for getting 240°C at the surface of the PWB.

Since the tip of the lead has exposed lead frame base material, there is a case not to be soldered, so please consider the soldering pattern on a print circuit board to solder well with the bottom and side surface of the lead.

7.6 Cleaning

Cleaning shall be carried out under the below conditions 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 : Since the influence to the product may changes by the conditions of the ultrasonic power, time, the tank size, PCB size, the product installation condition, etc., please evaluate with actual conditions and confirm before usage.

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

Solvent : Ethyl alcohol, Methyl alcohol

7.7 Lead pin

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

7.8 Storage and management after open

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

Storage temp. : 5 to 30°C

Storage humidity : 70%RH or less

7.8.2 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.

In case that one times reflow soldering are required, please complete your 2nd reflow soldering within 2 days after the 1st reflow soldering.

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

7.8.3 Baking before mounting

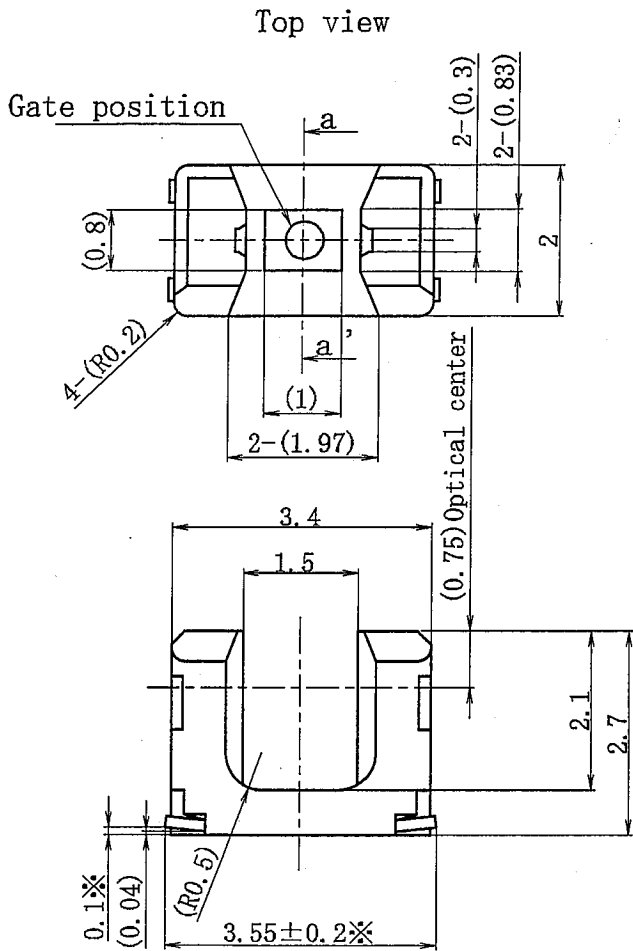
In case that it could not carry out the above treatment, it is able to mount with baking treatment.

However baking treatment shall be limited only 1 time. Although it is possible to have baking treatment with the sleeve package, the sleeve may become warped in the heat. Since a fixing tape for the sleeve does not have enough heat resistance, please remove it before baking.

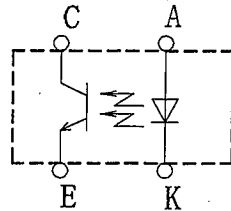
Recommended baking conditions : 100°C, 16 to 24 hours

REFERENCE

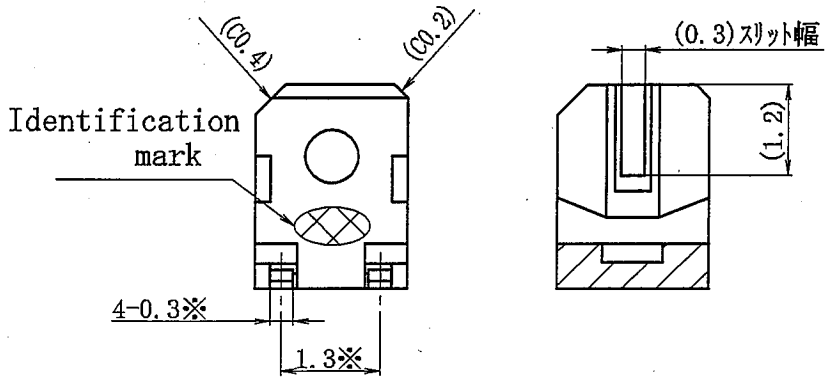
2.1 Outline Dimensions (Drawing No. CY13002i02) Scale : 10/1 Unit : mm



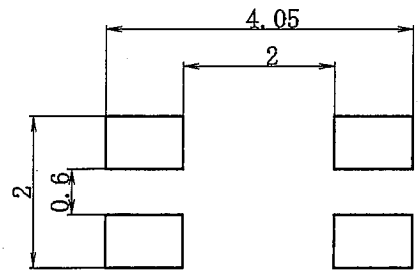
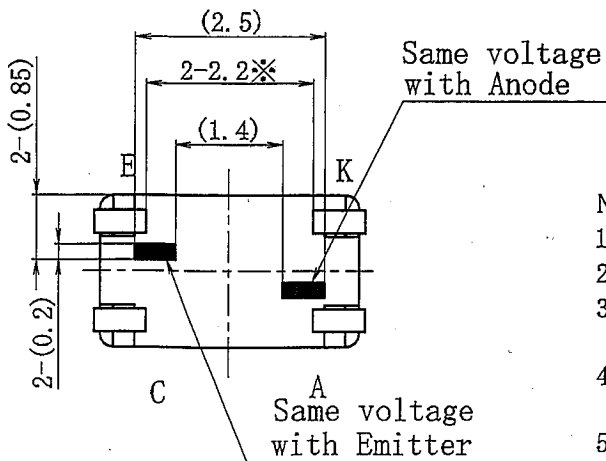
Circuit : Top View



A : Anode
K : Cathode
C : Collector
E : Emitter



<Reference> Recommended soldering pattern dimensions



Note

- 1) Unspecified tolerance shall be $\pm 0.1\text{mm}$.
- 2) Dimensions in parenthesis are shown for reference.
- 3) The dimensions indicated by * refer to the those measured from the lead base.
- 4) The dimensions shown do not include those of burrs. Burr's dimensions shall be 0.15mmMax .
- 5) The lead may be exposed at the shaded portion.
- 6) A green color mark is printed at the emitter side for identifying the direction.
- 7) The recommendation pattern receives the influence of reflow soldering and solder type etc.. Sufficiently after doing the verification of mounting, please decide.

3. Ratings and characteristics

3.1 Absolute maximum ratings

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

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	30	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	$^\circ\text{C}$
* Soldering temperature		T_{sol}	260	$^\circ\text{C}$

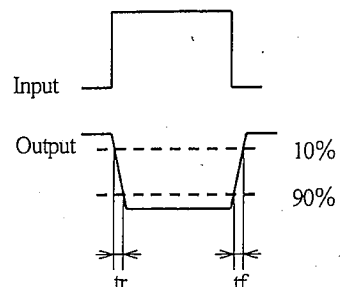
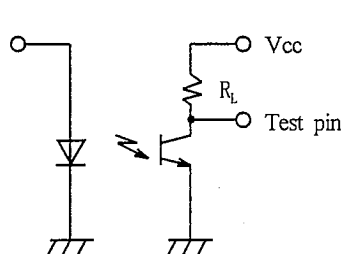
* Soldering time : 3 s or less

3.2 Electro-optical characteristics

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

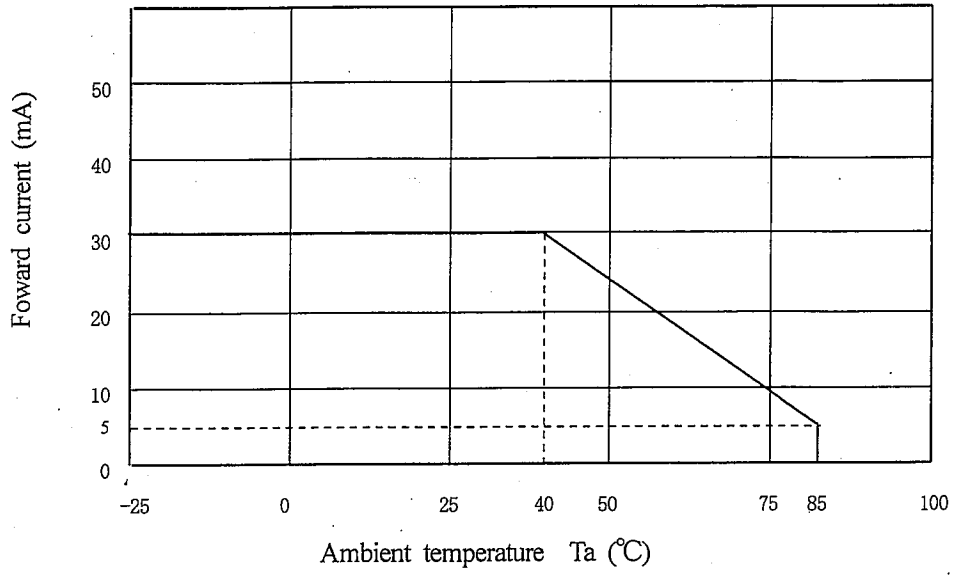
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Input	Forward voltage	V_F	$I_F=20\text{mA}$	-	1.2	1.4	V	
	Reverse current	I_R	$V_R=3\text{V}$	-	-	10	μA	
Output	Collector dark current	I_{CEO}	$V_{CE}=20\text{V}$	-	-	100	nA	
Transfer characteristics	Collector current	I_c	$V_{CE}=5\text{V}, I_F=5\text{mA}$	150	-	600	μA	
	Response time	(Rise)	t_r	$V_{CE}=5\text{V}, I_c=100\mu\text{A}$	-	50	150	μs
		(Fall)	t_f	$R_L=1\text{k}\Omega$	-	50	150	μs
	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)

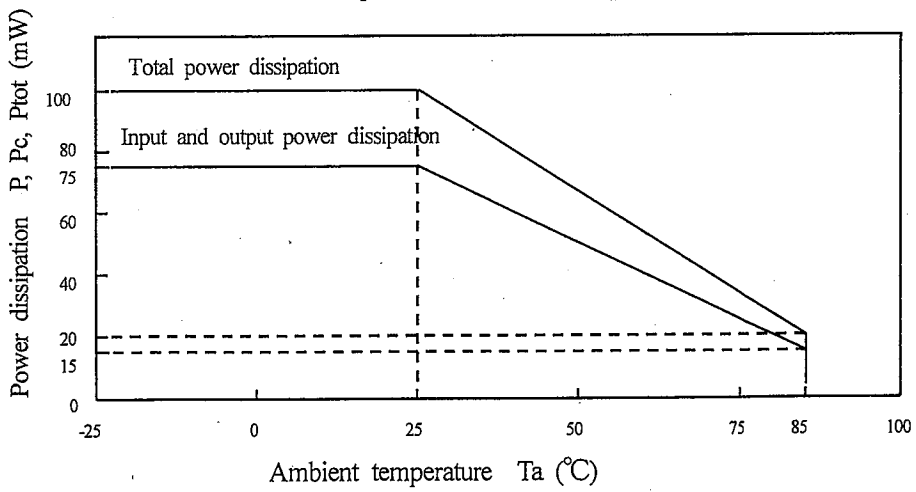


REFERENCE

Foward current vs. ambient temperature

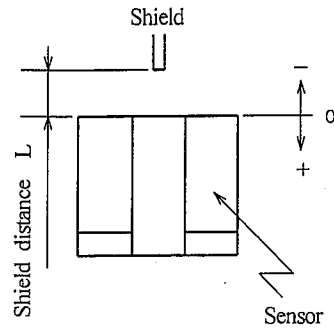
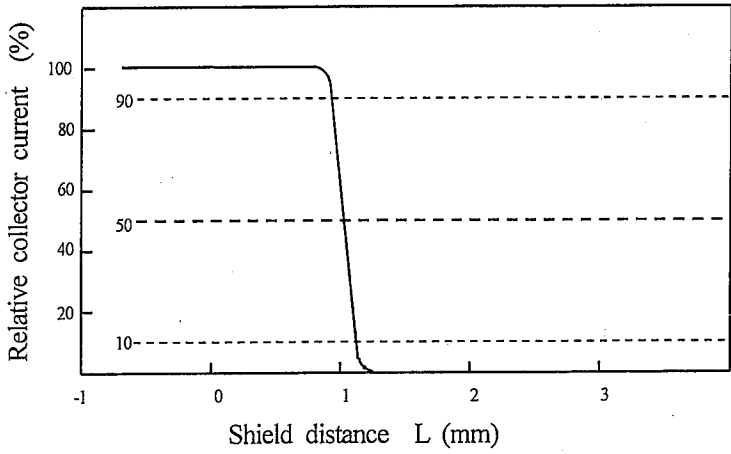


Power dissipation vs. ambient temperature



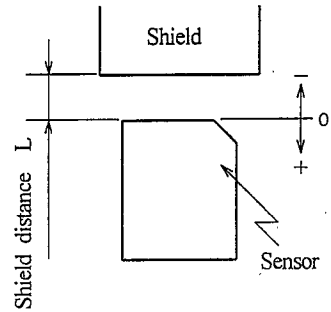
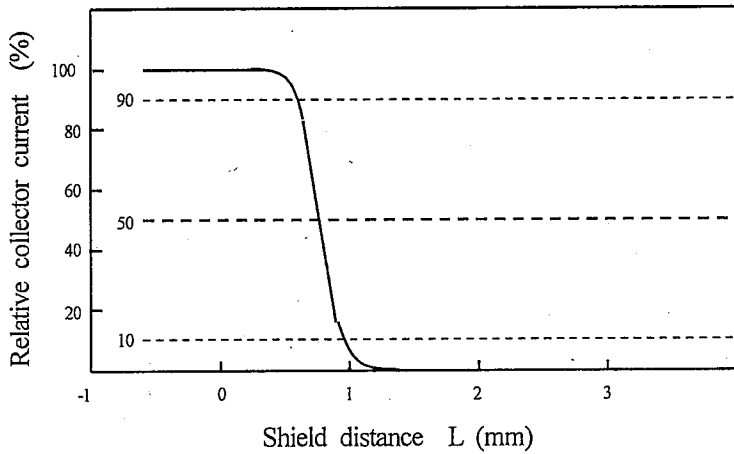
REFERENCE

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 Judgment Criteria	Samples (n)
			Defective (c)
Temperature cycling	1 cycle -40°C to +100°C (30min) (30min) 20 cycles test	$I_R \geq U \times 2$ $I_{CEO} \geq U \times 2$ $V_F \geq U \times 1.2$ $I_c \leq L \times 0.8$ 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	$I_F=20\text{mA}$, $T_a=25^\circ\text{C}$, 500h		n=22, c=0
Mechanical shock	15km/s ² , 0.5ms 3 times/ $\pm X$, $\pm Y$, $\pm Z$ direction		n=11, c=0
Variable frequency vibration	100 to 2000 to 100Hz/20min 2h/X, Y, Z direction 100m/s ²		n=11, c=0
Reflow soldering *	Reflow soldering condition : Attachment-1 Time of reflow soldering : 1 time	$I_c < L \times 0.8$	n=11, c=0

REFERENCE

5. Outgoing inspection

5.1 Inspection items

(1) Electrical characteristics

$V_F, I_R, BV_{ECO}, BV_{CEO}, I_C, I_{CEO}, V_{CE(sat)}$

(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 *	0.25

※	Crack	... Visible crack shall be defect.
	Split	} ... One which affects the electrical characteristics shall be defect.
	Chip	
	Scratch	
	The others	

6. Supplements

6.1 Parts

This product uses the below parts.

6.1.1 Light detector (Quantity : 1)

Type	Material	Maximum sensitivity (nm)	Sensitivity (nm)	Response time (μs)
Phototransistor	Silicon (Si)	930	700 to 1200	20

6.1.2 Light emitter (Quantity : 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

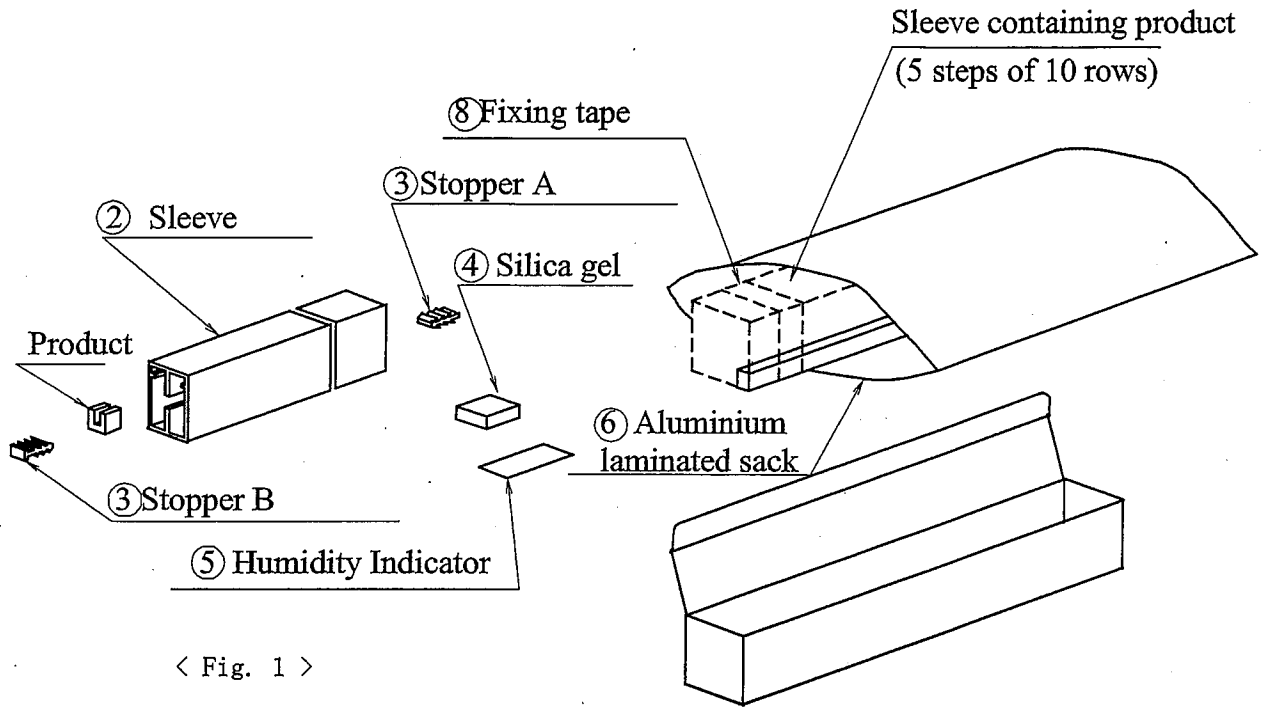
Case	Lead frame	Lead frame plating
Black PPS resin (UL 94V-0)	42 Alloy	SnCu plating

6.1.4 Others

This product shall not be proof against radiation flux.

REFERENCE

6.5 Packing (Drawing No. CY13003i09B)

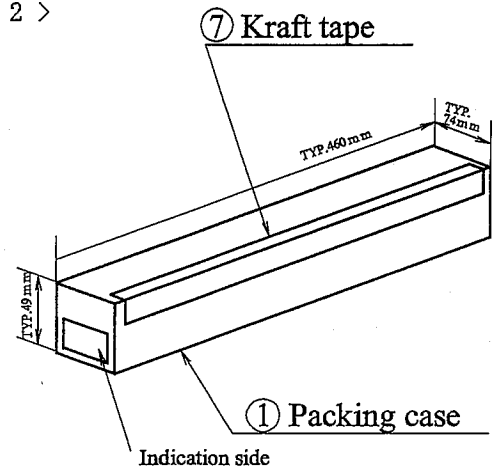


< Fig. 1 >

< Fig. 2 >

1. Packing materials

No	Name	Material	The number of use
1	Packing case	Paper corrugated cardboard	1
2	Sleeve	Polycarbonate	50
3	Stopper A, B	Rubber	50, respectively
4	Silica gel	—	1
5	Humidity indicator	—	1
6	Aluminium laminated sack	—	1
7	Kraft tape	—	—
8	Fixing tape	—	—



2. Packing quantity

1. Packing sleeve : 200pieces per 1 sleeve
2. Packing case : 10,000pieces per 1 case
(Gross weight : Approx 875 g)

3. Indication items

The contents of the carton indication conforms to EIAJ C-3 and the following items are indicated. Model No., Internal production control name, Quantity, Packing date, Corporate name, Country of origin

4. Packing method

1. 200 products are contained to a sleeve.
(The receipt method is shown in the above figure.) <Fig.1>
2. 50 sleeves (5 steps of 10 rows), a silica gel and a humidity indicator are put into an Aluminium laminated sack, then contained into a packing case after sealing. <Fig.2>
3. The packing case is sealed off with the kraft tape.
Indicates "ModelNo.", "Sharp management model No.", "Quantity" and "Lot No." on the packing case. <Fig.3>

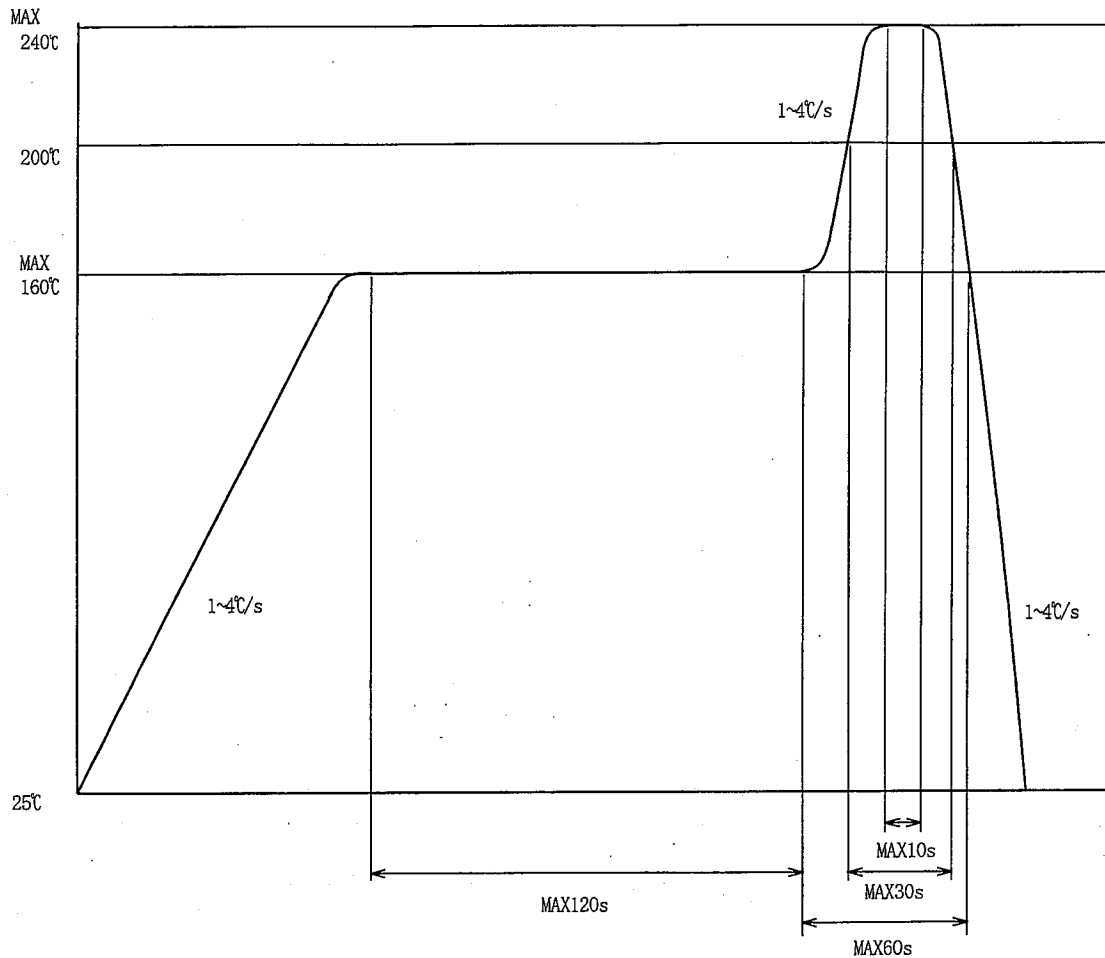
REFERENCE

attachment-1

Precautions for Soldering photointerrupter

1. In case of reflow soldering,

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.