

# SHARP

OPTO-ELECTRONIC DEVICES DIVISION  
ELECTRONIC COMPONENTS AND DEVICES GROUP  
SHARP CORPORATION

## SPECIFICATION

DEVICE SPECIFICATION FOR

MODEL No.

PHOTO INTERRUPTER

GP1S194HCZ0E

REFERENCE

Specified for

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Enclosed please find copies of the Specifications which consists of 12pages 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

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BY

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PRESENTED

DATE

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BY

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Y. Oda,  
Department General Manager of  
Engineering Dept., III  
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Electronic Components and Devices Group  
SHARP CORPORATION



Product name : PHOT INTERRUPTER

Model No. : GP1S194HCZ0F

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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 ;

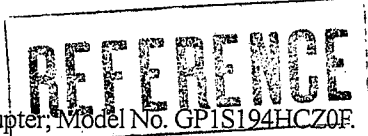
( • Transportation control and safety equipment (aircraft, train, automobile etc.)  
 • Traffic signals   • Gas leakage sensor breakers   • Rescue and security equipment  
 • Other safety equipment )

- (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, Model No. GP1S194HCZ0F.

2. Outline : Refer to the attached drawing No. CY12950i02.

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 Parts

Refer to the attached sheet, Page 10.

6.2 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<sub>s</sub>, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

6.3 Specified brominated flame retardants

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

6.4 Compliance with each regulation

6.4.1 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)

6.4.2 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 <sup>6+</sup> )	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 .

6.5 Product mass : Approx. 24mg

6.6 Packing

Refer to the attached drawing No. CY12951i09B

REFERENCE

## 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)

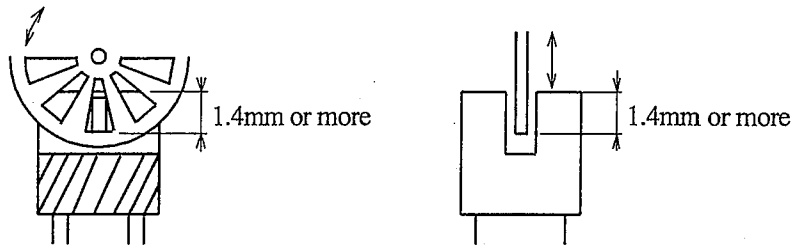
### 2) Prevention of detection error

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 1.4mm or more from the top of elements.

(Example)



### 4) Soldering

To solder onto lead pins, solder at the position of 0.3mm or more from the package's bottom at 260°C for 3 s or less.

Please don't bend lead pins from the root of package when soldering.

Please also 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.

Please have soldering adjustment, etc. after GP1S194HCZ0F is cooled down, and also note that the outer mold resin may be meltdown by heating for a long time.

### 5) 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 change 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

### 6) 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.

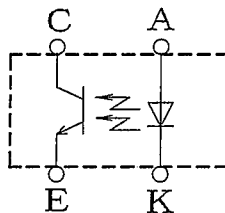
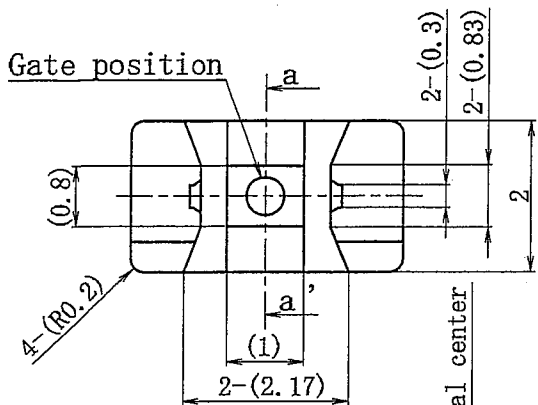


2.1 Outline Dimensions

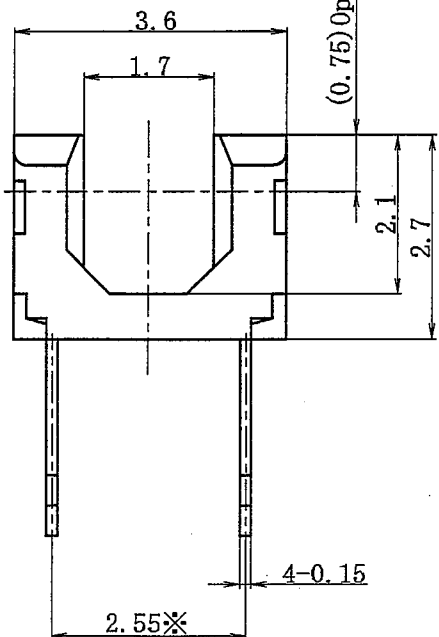
Drawing No. CY12950i02 Scale : 10/1 Unit : mm

Top View

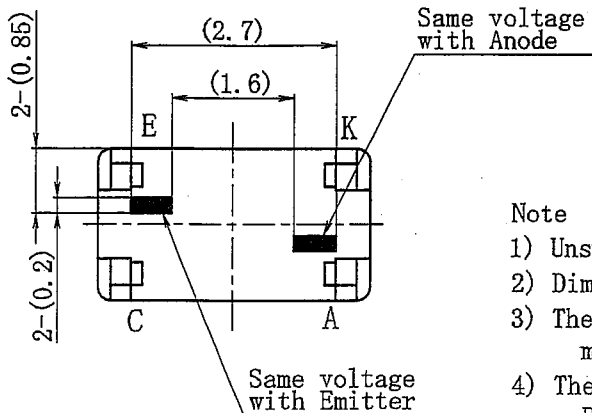
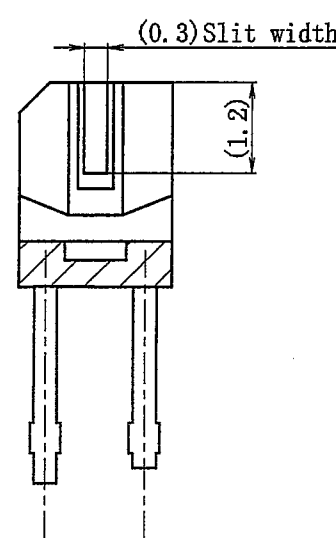
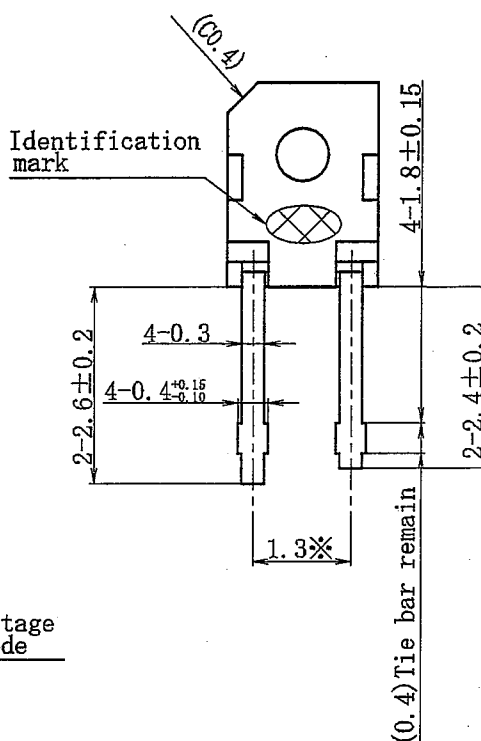
Circuit : Top View



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



a-a' section



Note

- 1) Unspecified tolerance shall be  $\pm 0.1$ 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 0.15Max.
- 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 edge surface of the tie bar remains has poor solderability due to no plating, so please select a proper PCB thickness to avoid any influences. 1.2mm thickness shall be recommended.



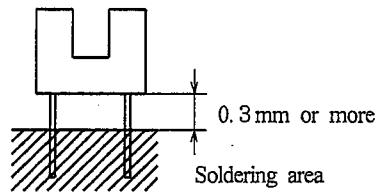
3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25°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	°C
Storage temperature		$T_{stg}$	-40 to +100	°C
* Soldering temperature		$T_{sol}$	260	°C

\* Soldering time : 3 s or less

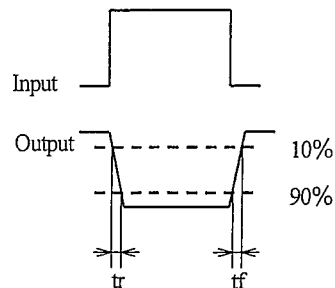
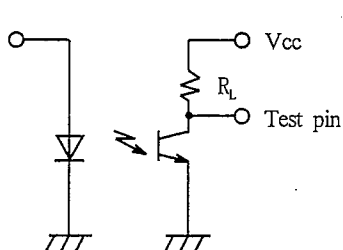


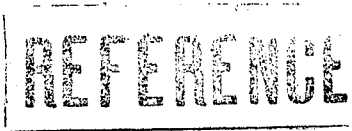
3.2 Electro-optical characteristics

Ta=25°C

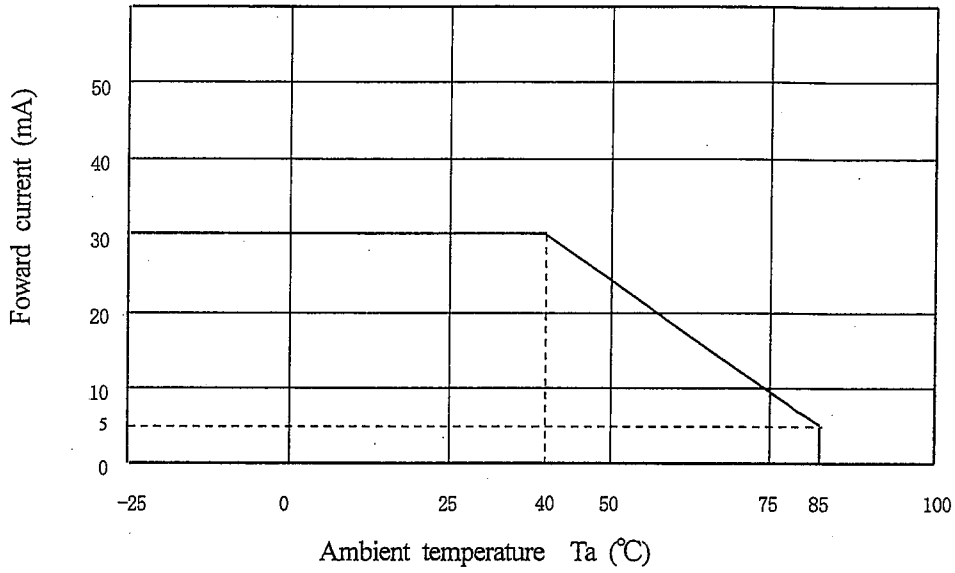
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Input	Forward voltage	$V_F$	$I_F=20mA$	-	1.2	1.4	V	
	Reverse current	$I_R$	$V_R=3V$	-	-	10	$\mu A$	
Output	Collector dark current	$I_{CEO}$	$V_{CE}=20V$	-	-	100	nA	
Transfer characteristics	Collector current	$I_c$	$V_{CE}=5V, I_F=5mA$	150	-	600	$\mu A$	
	Response time	(Rise)	$t_r$	$V_{CE}=5V, I_c=100 \mu A$ $R_L=1k \Omega$	-	50	150	$\mu s$
		(Fall)	$t_f$		-	50	150	$\mu s$
	Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_F=10mA, I_c=40 \mu A$	-	-	0.4	V

(Test circuit for response time)

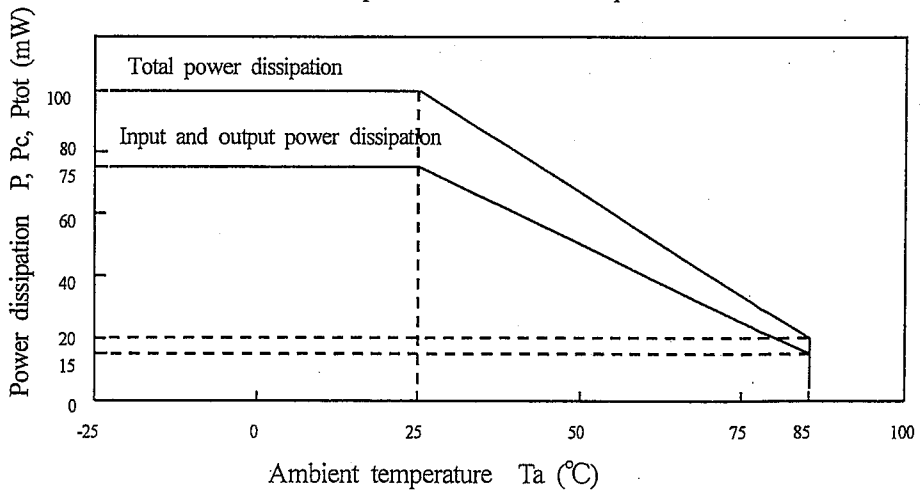




Foward current vs. ambient temperature

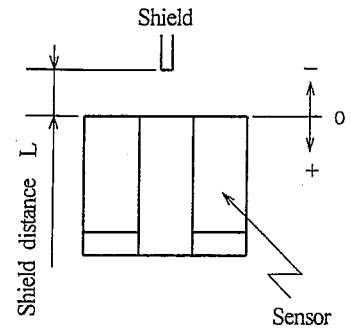
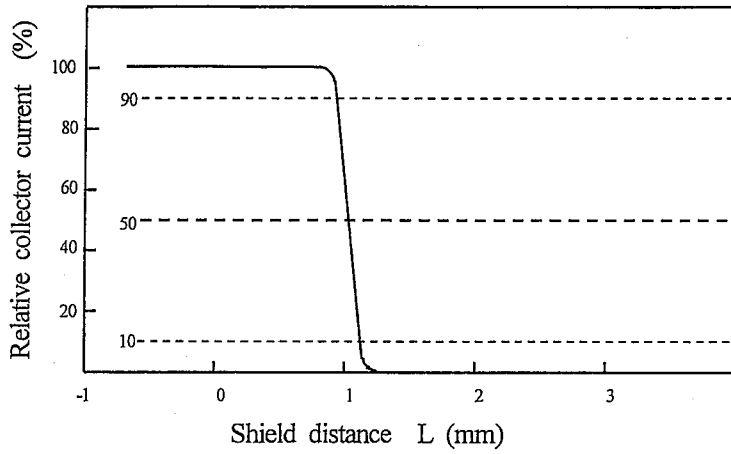


Power dissipation vs. ambient temperature



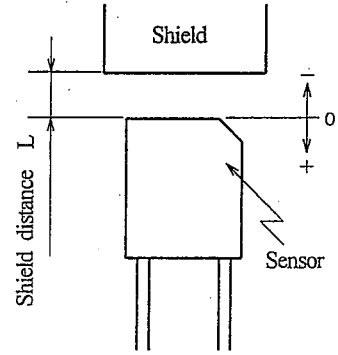
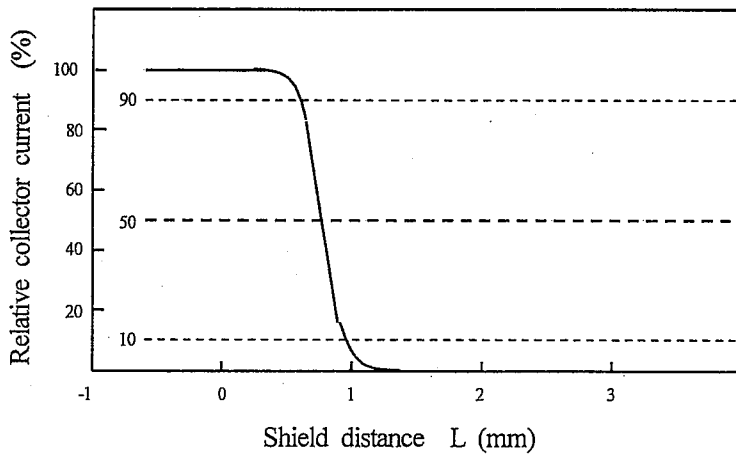


Relative collector current vs. shield distance 1 (Reference value)



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.

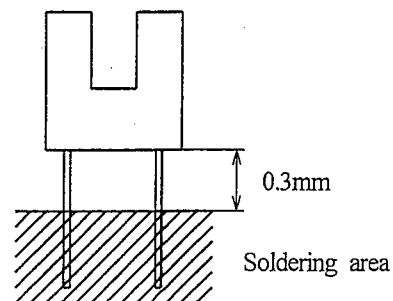
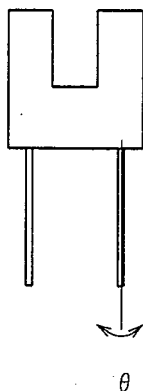
Confidence level : 90%

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	$I_F=20mA$ , $T_a=25^\circ C$ , 500h		n=22, c=0
Mechanical shock	15000m/s <sup>2</sup> , 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 <sup>2</sup>		n=11, c=0
Terminal strength (Tension)	Weight: 3.0N 30s/each terminal		n=11, c=0
Terminal strength (Bending) *1	Weight: 1.0N 0° →90° →0° →-90° →0 1time bending		n=11, c=0
Soldering heat *2	260°C, 3s Immerse up to 0.3mm from the bottom face of package.		n=11, c=0
Solder ability *2, *3	245°C, 3s Prior disposition: Dip rogin flux. Then immerse up to 0.3mm from the bottom face of package.	Judgment only appearance Solder shall adhere at less than 95% area of immersed portion of lead except the tie bar remain portions.	n=11, c=0

\* 1 Terminal bending direction is shown below.

\*2 Soldering area is shown below.



\*3 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-8(TAMURA KAKEN CORPORATION).

## 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.

\* Chip  
Split  
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 (Quantity : 1)

Type	Material	Maximum sensitivity (nm)	Sensitivity (nm)	Response time ( $\mu$ s)
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

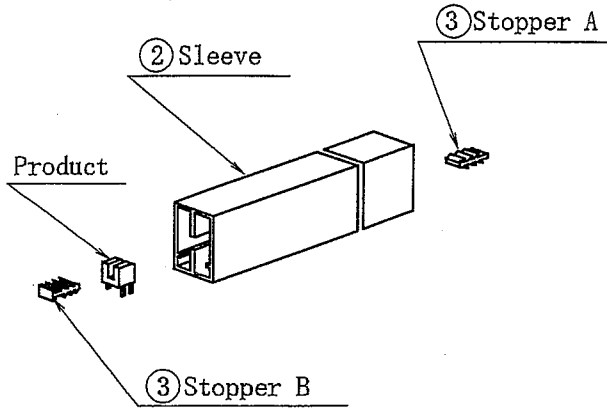
Case	Lead frame	Lead frame plating
Black PPS resin (UL 94V-0)	42 Alloy	SnCu plating

## 6.1.4 Others

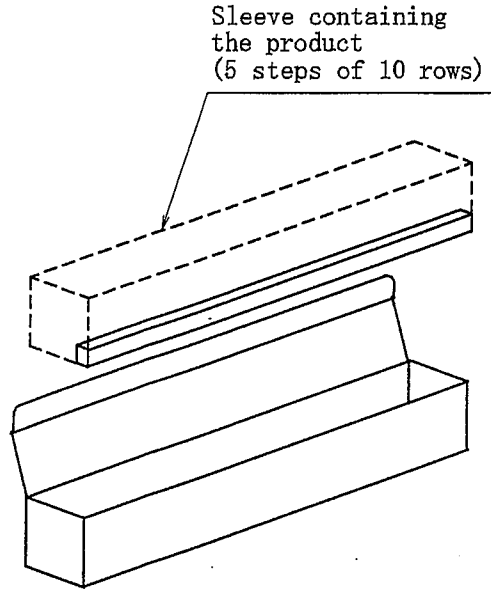
This product shall not be proof against radiation flux.

**REFERENCE**

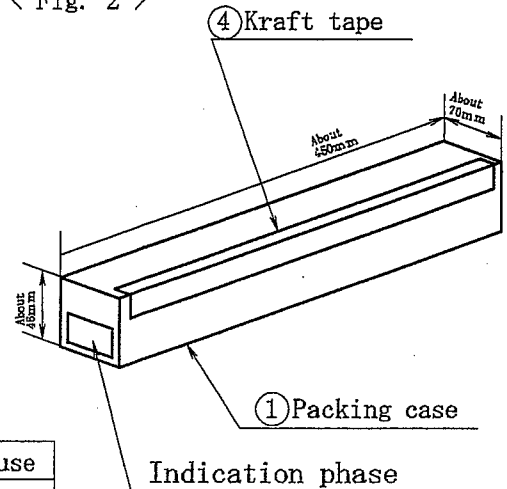
6.6 Packing (Drawing No. CY12951i09B)



< Fig. 1 >



< Fig. 2 >



< Fig. 3 >

1. Packing material

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	Kraft tape	—	—

2. Packing quantity

1. Packing sleeve : 200pieces per 1 sleeve
2. Packing case : 10000pieces per 1 case  
(Gross weight : Approx 850 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) are contained into a packing case.  
<Fig.2>
3. The packing case is sealed off with the kraft tape.  
Indicates on the packing case Model No., Internal production control name, Quantity, Packing date, Corporate name, Country of origin. <Fig.3>