

SHARP

OPTO-ANALOG DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

MODEL No. PHOTOINTERRUPTER
GP1A98HIGZ01

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 Feb, 20, 2008

BY For J. Ishiyama

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



Product name : PHOTOINTERRUPTER

Model No. : GP1A98HCZ0F

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 ;

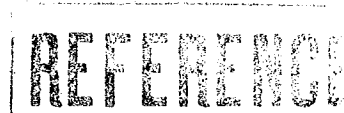
- Transportation control and safety equipment (aircraft, train, automobile etc.)
- Traffic signals • Gas leakage sensor breakers • Rescue and security equipment
- Other safety equipment

- (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. GP1A98HCZ0F.

2. Outline

Refer to the attached drawing No. CY14248i02.

3. Ratings and characteristics

Refer to the attached sheet, Page 5, 6, 7, 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 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)

6.3 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 biphenyl 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 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 .

6.5 Product mass : Approx. 90mg

6.6 Packing

Refer to the attached drawing No. CY14249i09

6.7 Truth table (In case of external addition pull-up resistance to Vout terminal)

Light beam	Output
Interrupted	Low
Uninterrupted	High

REFERENCE

7. Notes

7.1 About power supply line

In order to stabilize power supply line, connect a by-pass capacitor of more than $0.01\mu\text{F}$ between Vcc and GND near the device.

7.2 About output line noise

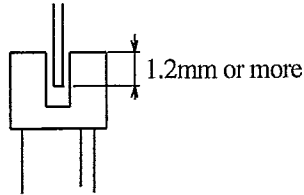
To avoid line noise at Vo terminal, a capacitor shall be connected between Vo and GND.

In case of necessity of further noise suppression, it is recommended to add EMI suppression part such as ferrite bead. Please check the influence with actual equipment.

7.3 Position of opaque board

Opaque board shall be installed at place 1.2mm or more from the top of elements.

(Example)



7.4 Recommended operating condition

Item	Symbol	Operating Temperature	MIN.	MAX.	Unit
Output current	I_O	Ta=0~60deg	-	5	mA
Forward current	I_F		10	19	mA
Supply voltage	Vcc		4.5	22	V

7.5 Soldering

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

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

And please take care not to apply outer force to both lead pins and the package.

Please execute it after confirming there is no problem on reliability in a real machine enough because it changes depending on the work method etc.

Please don't do soldering with preheating, and please don't do soldering by reflow. In case of repairing, please make sure GP1A98HCZ0F is cooled down, please consider the outer mold resin is meltdown in case a continuous heat is applied.

7.6 Soldering flux

Some soldering flux may cause damage like package crack by synergetic effect of alcohol component in the flux And soldering heat. Therefore appearance and reliability of the product shall be checked with the soldering flux in advance.

7.7 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 : 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.

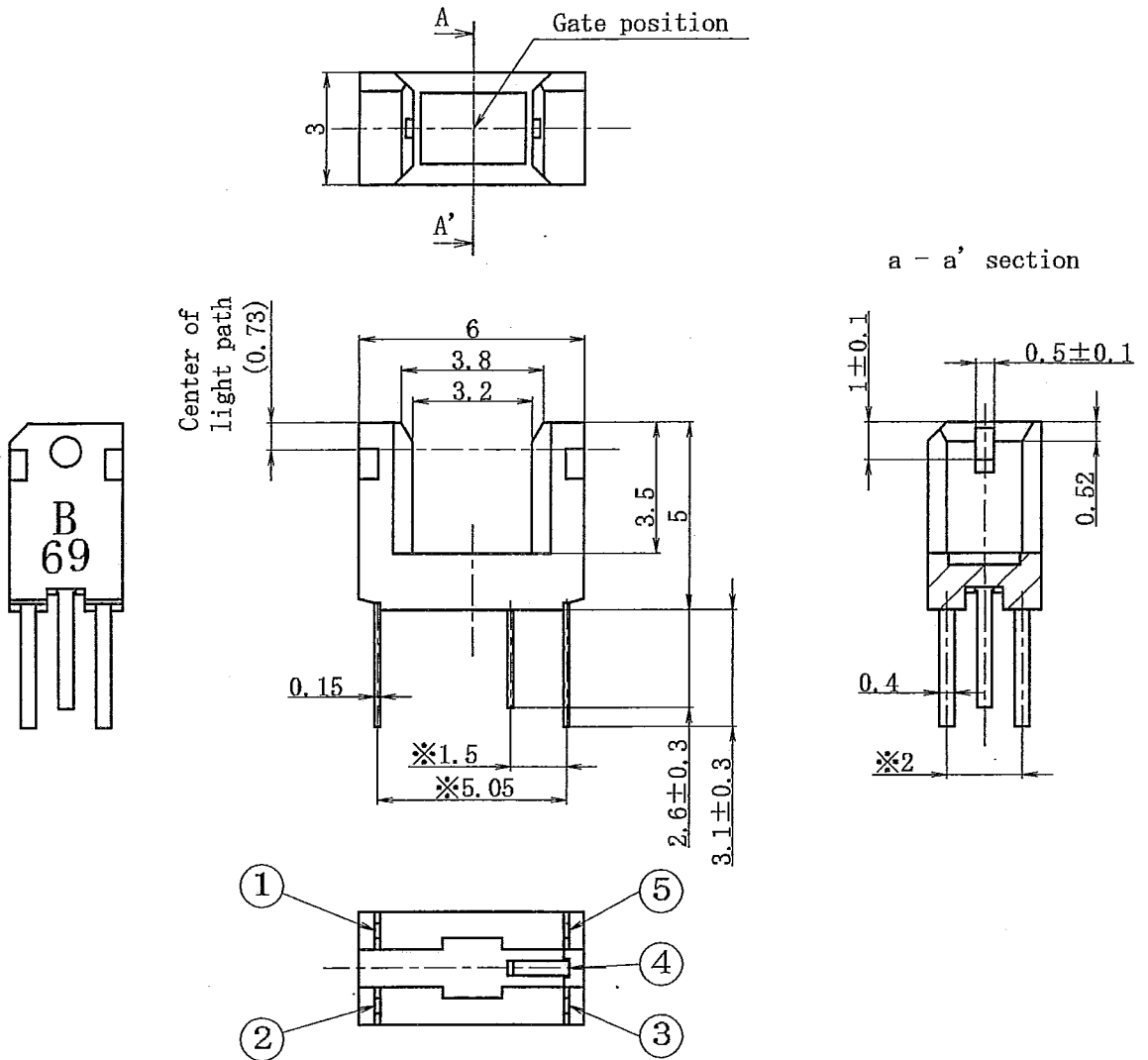
Solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

7.8 Lead pin

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

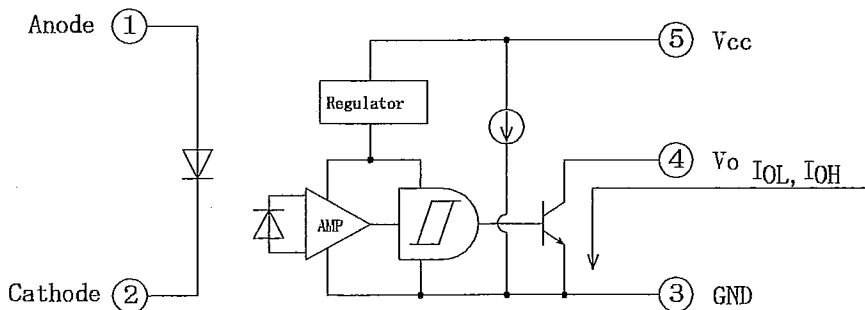


2.1 Outline Dimensions (Drawing No. CY14248i02) Scale:5/1



- Note
- 1) Unspecified tolerance shall be $\pm 0.2\text{mm}$.
 - 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 0.15 MAX.
 - 5) Residual gate shall be 0.5mm MAX.
 - 6) The output distinction mark and the date code are printed at the emitter side with green color.

Circuit diagram



REFERENCE

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25°C

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	30	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P	75	mW
Output	Supply voltage	V_{CC}	-0.5~24	V
	Output voltage	V_o	-0.5~24	V
	*1 Output current	I_o	8.0	mA
	*1 Power dissipation	P_o	100	mW
Total power dissipation		P_{tot}	150	mW
Operating temperature		T_{opr}	-25 to +85	°C
Storage temperature		T_{stg}	-40 to +100	°C
*2	Soldering temperature	T_{sol}	260	°C

*1 The derating factors of absolute maximum ratings due to ambient temperature are shown in Fig. 1, 2, 3.

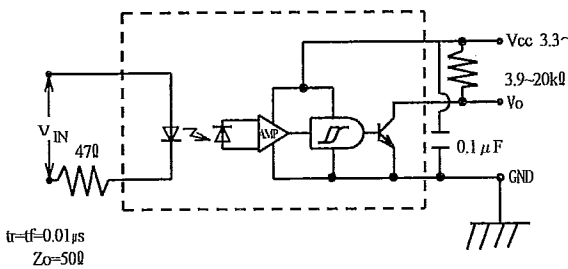
*2 Soldering time : 3s or less

REFERENCE
T_a=25°C

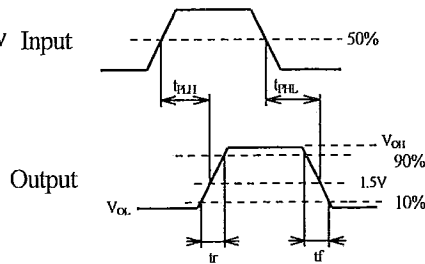
3.2 Electro-optical characteristics

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit		
Input	Forward voltage	V _F	I _F =10mA	-	1.2	1.4	V		
	Reverse current	I _R	V _R =3V	-	-	10	μA		
Output	Operating voltage	V _{CC}	T _a =T _{opr}	3.3	-	24.0	V		
	*1 Low level output voltage	V _{OL}	V _{CC} =3.3~24V, I _F =0mA, I _{OL} =5mA	-	0.1	0.4	V		
	*1 High level output current	I _{OH}	V _{CC} =3.3~24V, I _F =10mA, V _O =3.3~24V	-	-	100	μA		
	Low level supply current	I _{CCL}	V _{CC} =3.3~24V, I _F =0mA	-	1.8	4.0	mA		
	High level supply current	I _{CCH}	V _{CC} =3.3~24V, I _F =10mA	-	2.0	4.0	mA		
Transfer characteristics	*2 "L→H" threshold input current		I _{FLH}	V _{CC} =3.3~24V, R _L =3.9~20kΩ	-	-	8.0	mA	
	*2,3 Hysteresis		I _{FHL} /I _{FLH}	V _{CC} =3.3~24V, R _L =3.9~20kΩ	0.55	0.8	0.95	-	
	*4 Response time	"L→H" Transmission time		t _{PLH}	V _{CC} =3.3~24V, R _L =3.9~20kΩ, I _F =10mA	-	2	100	μs
		"H→L" Transmission time		t _{PHL}		-	10	100	μs
		Rise time		t _r		-	10	20	μs
		Fall time		t _f		-	10	20	μs

- *1 The direction of output current running is shown in internal connection diagram
When output voltage is low(V_{OL}), I_{OL} runs into output transistor.
When output voltage is high(V_{OH}), I_{OH} runs into output transistor as leak current.
- *2 I_{FLH} is forward current value when output voltage changing from "L" to "H".
- *3 I_{FHL} is forward current value when output voltage changing from "H" to "L".
- *4 Test circuit of response time is shown the below.



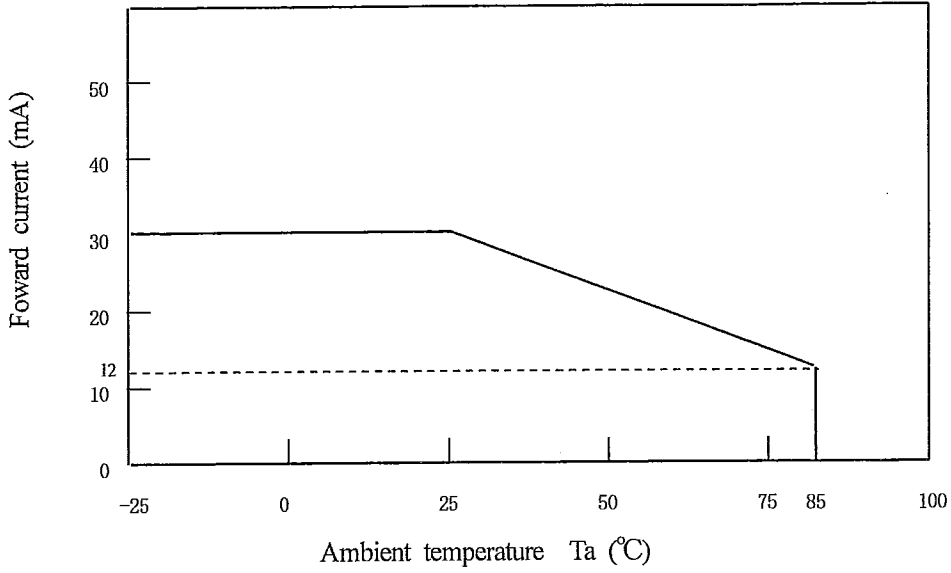
Test circuit for response time



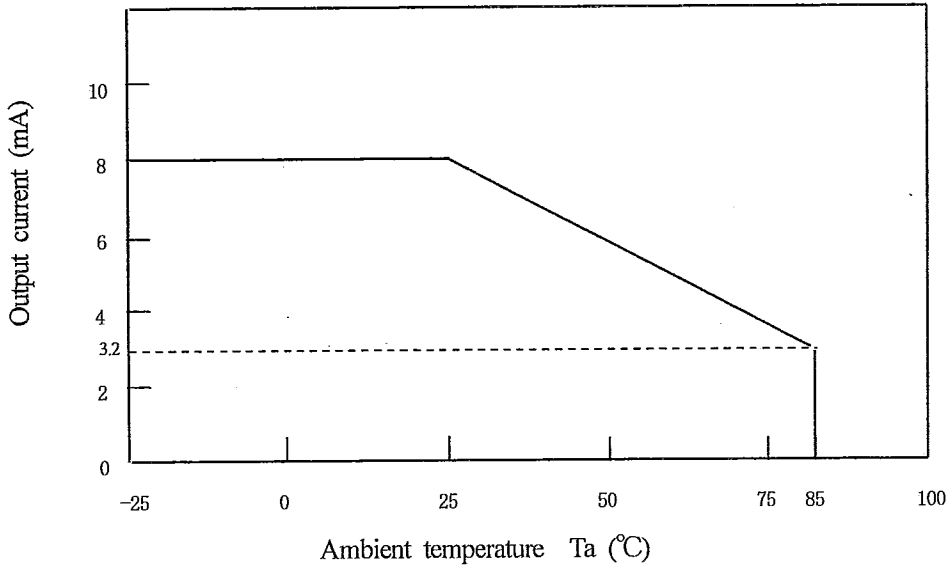
Timing chart

REFERENCE

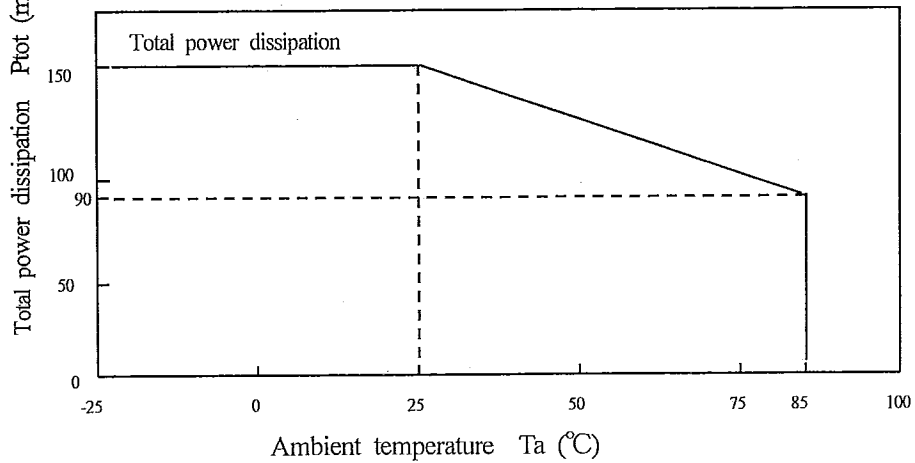
Forward current vs. ambient temperature



Output current vs. ambient temperature

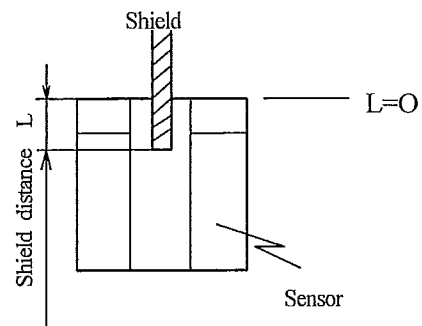
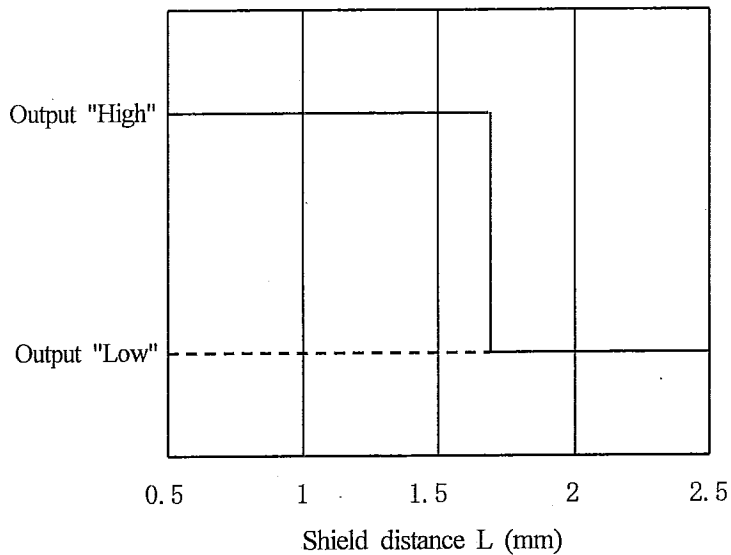


Total power dissipation vs. ambient temperature



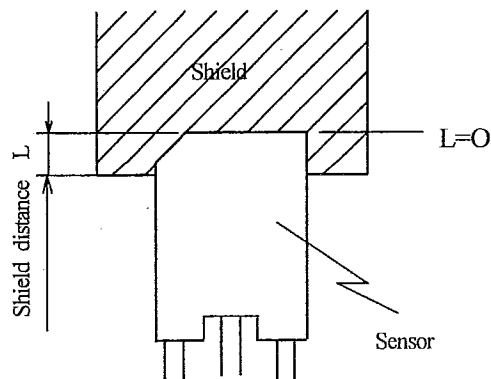
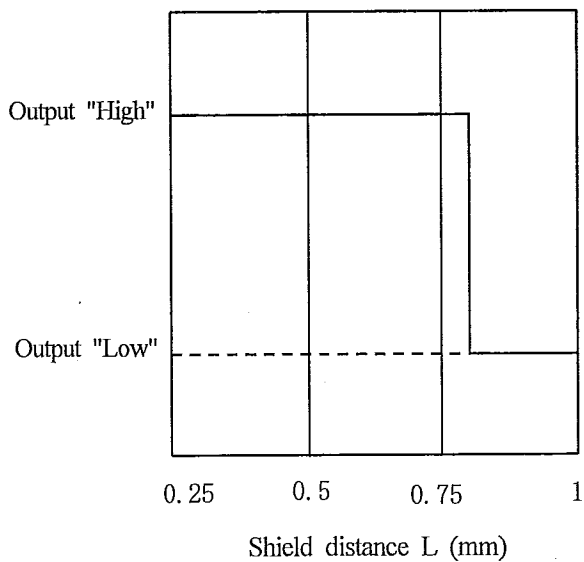


Detecting position characteristics 1 (Reference value)



Test condition
 $I_F=10\text{mA}$
 $V_{CC}=12\text{V}$
 $T_a=25^\circ\text{C}$

Detecting position characteristics 2 (Reference value)



Test condition
 $I_F=10\text{mA}$
 $V_{CC}=12\text{V}$
 $T_a=25^\circ\text{C}$

REFERENCE

4. Reliability

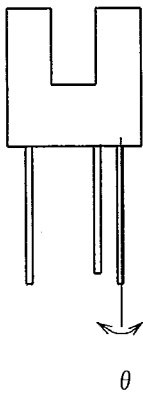
The reliability of products shall satisfy items listed below.

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	$V_F \geq U \times 1.2$ $I_R \geq U \times 2$ $V_{OL} \geq U \times 1.2$ $V_{OH} \leq L \times 0.8$ $I_{CCL} \geq U \times 1.2$ $I_{CCH} \geq U \times 1.2$ $I_{FLH} \geq U \times 1.2$ $I_{FLH}/I_{FHL} \geq U+0.04$ $I_{FLH}/I_{FHL} \leq L-0.04$	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	$I_F=10mA$, $T_a=25^\circ C$, 500h		n=22, c=0
Mechanical shock	15000m/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
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		U: Upper specification limit L: Lower specification limit n=11, c=0
Soldering heat	260°C, 3s		n=11, c=0
Solder ability *2	245°C, 3s Prior disposition: Dip rogin flux.	Judgment only appearance Solder shall adhere at less than 95% area of immersed portion of lead. n=11, c=0	

* 1 Terminal bending direction is shown below.



*2 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

$V_F, I_R, V_{OL}, I_{OH}, I_{CCL}, I_{CCH}, I_{FLH}$

(2) Appearance

5.2 Sampling method and Inspection level

A single sampling plan, normal inspection based on ISO 2859 is applied.

Defect	Inspection item	Inspection level	AQL (%)
Major fault	Characteristics defect	II	0.1
Minor fault	Appearance defect except the above mentioned. ※	II	0.25

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

6. Supplements

6.1 Parts

This product uses the below parts.

6.1.1 Light detector (Quantity : 1)

(Using a silicon photodiode as light detecting portion, and a bipolar IC as signal processing circuit.)

Type	Maximum sensitivity (nm)	Sensitivity (nm)	Response time (μ s)
Photodiode	900	700 to 1200	100

6.1.2 Light emitter (Quantity : 1)

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

6.1.3 Material

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

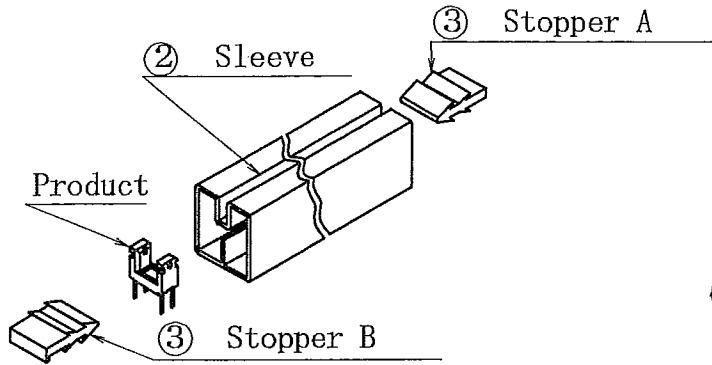
6.1.4 Others

This product shall not be radiation flux proof.

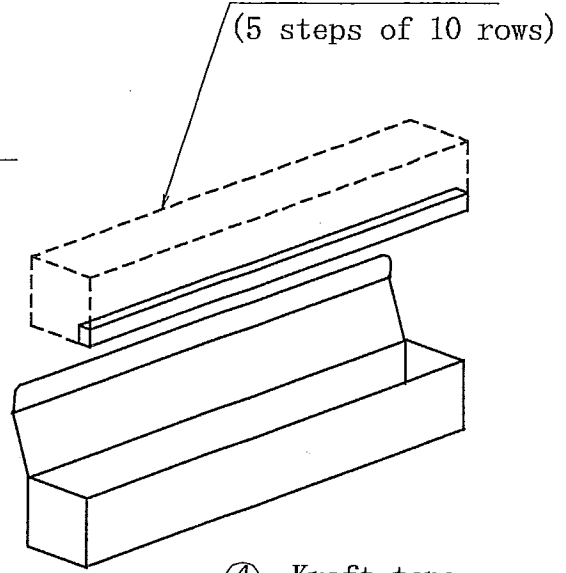
Laser generator is not used.

6.6 Packing (Drawing No. CY14249i09)

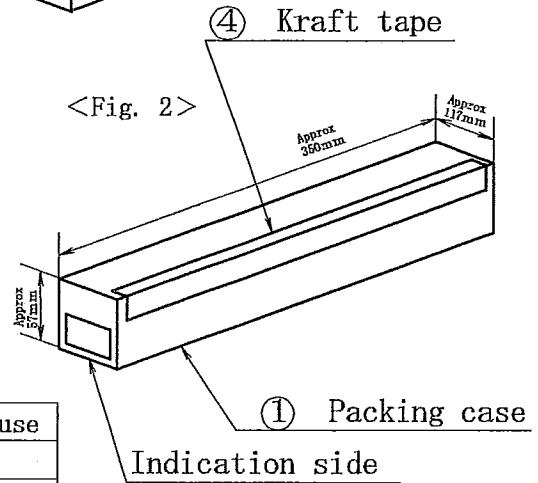
REFERENCE
The sleeve containing the product



<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	Paper	—

2. Packing quantity

1. Packing sleeve : 100pieces per 1 sleeve
2. Packing case : 5000pieces per 1 case
(Gross weight : Approx 1150 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. 100 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 "ModelNo.", "Sharp management model No.", "Quantity"and"Lot No."on the packing case. <Fig. 3>