

REFERENCE

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SHARP

SYSTEM DEVICE DIVISION
ELECTRONIC COMPONENTS AND DEVICES GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

DISTANCE MEASUREMENT SENSOR

MODEL No.

GP2Y0E02A

Specified for

Enclosed please find copies of the Specifications which consists of 11 pages including cover.
This specification sheets and attached sheets shall be both side copy.
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

Feb. 12, 2013

BY

T. Ichinose

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Development Dept. III
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Electronic Components and Devices Group
SHARP CORPORATION

Product name : Distance Measuring Sensor

Model No. : GP2Y0E02A

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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) Please do verify the validity of this part after assembling it in customer's products, when customer wants to make catalogue and instruction manual based on the specification sheet of this part.

(2) 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 (3) or (4), please be sure to observe the precautions given in those respective paragraphs.

(3) 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

(4) 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
- Power generation and power transmission control system (Key system)

(5) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above four 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 the characteristics of the distance measuring sensor: Model No. GP2Y0E02A

2. Outline

Refer to the attached drawing No. CY15126i02, Page3

3. Ratings and characteristics

Refer to the attached sheet, Page 4.

4. Reliability

Refer to the attached sheet, Page 6.

5. Outgoing inspection

Refer to the attached sheet, Page 6.

6. Supplements

6-1 GP2Y0E02A Example of output distance characteristic.

Refer to the attached sheet, page 7.

6-2 GP2Y0E02A Example of directional angle of emitting beam.

Refer to the attached sheet, page 7.

6-3 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 (Methyl chloroform)

6-4 Product mass : Approx. 0.75g (TYP)

6-5 Compliance with each regulation

6-5-1 The RoHS directive(2002/95/EC)

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

Object substances: mercury, lead (except for lead in high melting temperature type solders and glass of electronic components), cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

6-5-2 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)
Distance measuring sensor	✓	✓	✓	✓	✓	✓

✓ : 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 .

7. Notes

Refer to the attached sheet, Page 9.

8. Packing specification

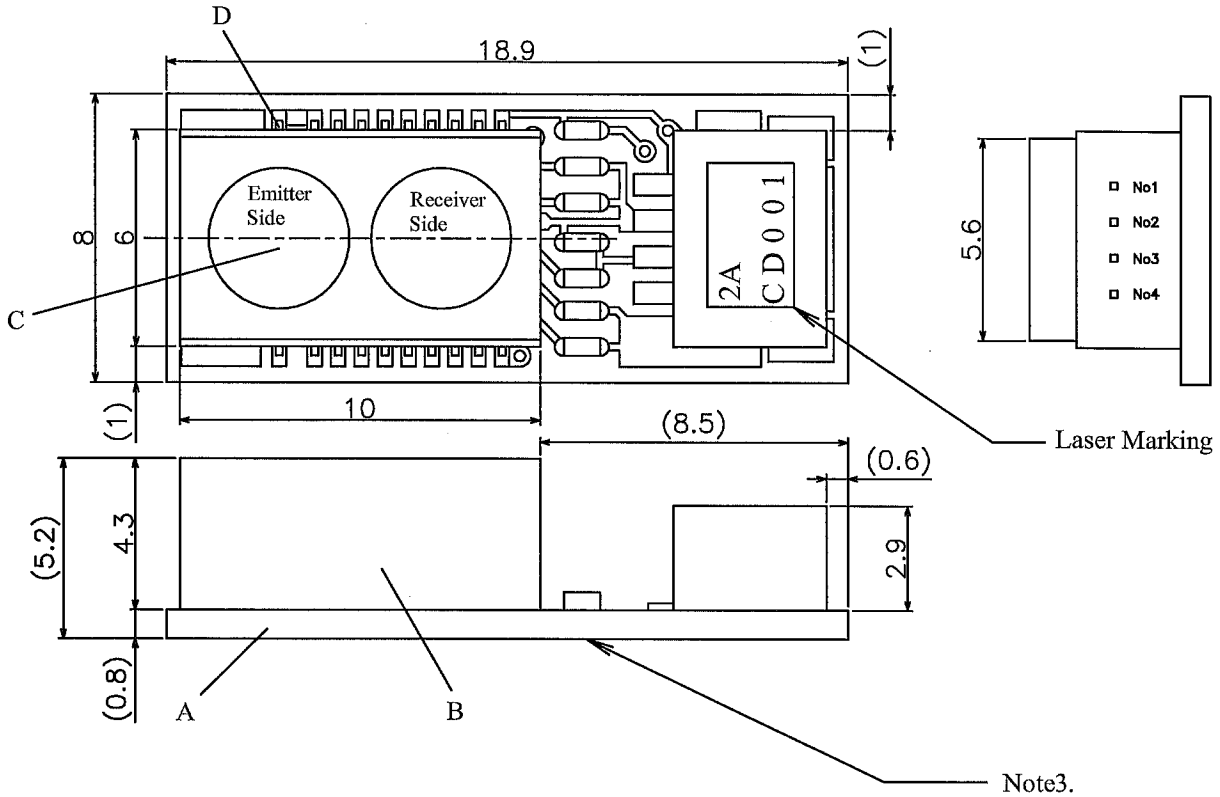
Refer to the attached drawing No. CY15127i09, Page 10.

GP2Y0E02A (RD-13G004)

2.Outline

(Drawing No. CY15126i02)

Scale: 5/1 Unit: mm



No	Symbol	Pin name
No1	VDD	Supply Voltage
No2	GND	Ground
No3	Vout(A)	Output Terminal
No4	GPIO1	Input Terminal for Active/Stand-by Control

- Note1: Unspecified tolerance shall be $\pm 0.2\text{mm}$
 Note2: The dimensions in parenthesis are shown for reference
 Note3: The PCB backside has some open pattern. Please do not short circuit of these pattern.

- Connector
SM04B-SRKS-TB(HF)
- Housing Recommendation
SHR-04V-BK-B or
SHR-04V-S-B
(JST Mfg. Co., Ltd.)

• Materials

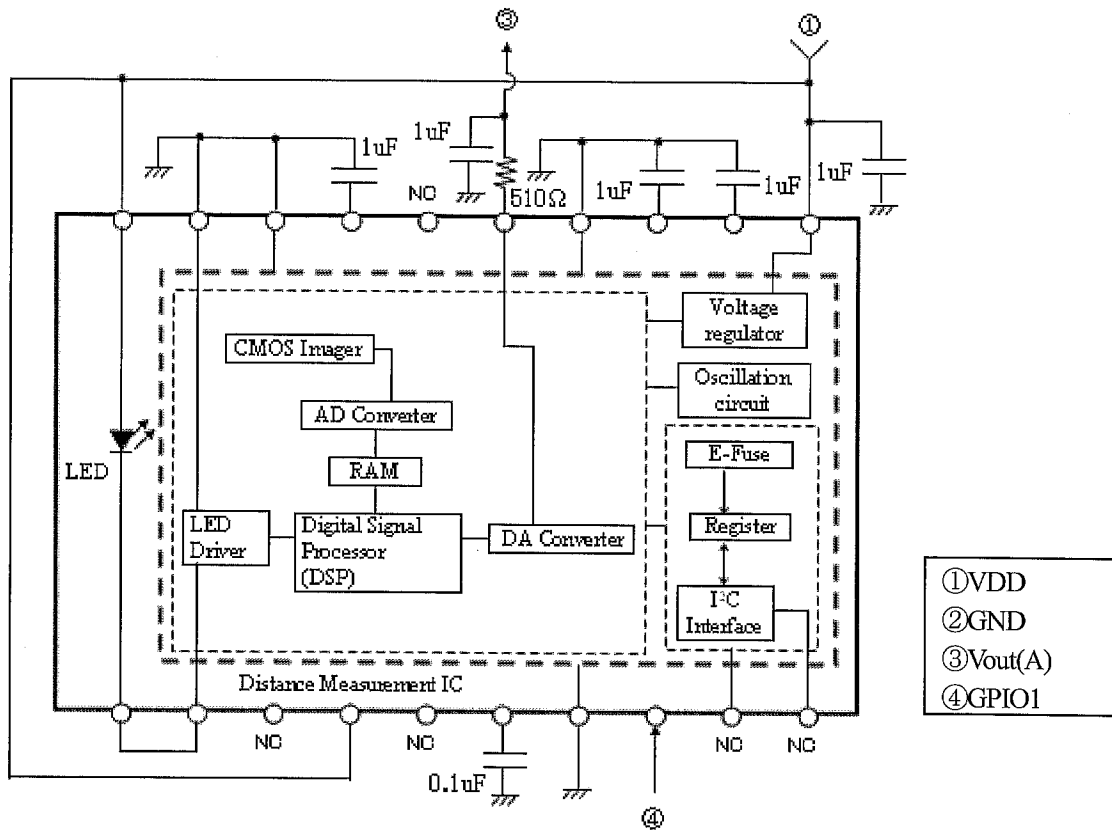
A	PCB	Glass-Epoxy (UL94-V0)
B	Package	Black LCP (UL94-V0)
C	Lens	Epoxy Resin with visible-cut filter
D	Device Terminal	42 Alloy (PD-Au Plate)

Laser Marking

- 2A — GP2Y0E02A (Model No)
CN001 — Lot No.
 — Month (1 to 9,O,N,D)
 (DIN standard symbol)
 — Year (DIN standard symbol)
 DIN standard year production
 (Remove G,I,O,Q,Y,Z)
 (It repeats itself by a period for 20 years.)

Year	Symbol
2012	C
2013	D
⋮	⋮
2028	W
2029	X

3-1. Schematic



Please use an electric source with an output current of 150mA or more because LED pulse current is more than 100mA.

3-2. Absolute maximum ratings

Ta=25°C (unless otherwise specified)

Parameter	Symbol	Ratings	Unit	Remark
Supply voltage	VDD	-0.3 to +3.6	V	-
Output terminal voltage	Vout(A)	-0.3 to +2.8	V	-
Output current	Iout(A)	-6.0 to +6.0	mA	-
Input terminal voltage	GPIO1	-0.3 to VDD+0.3	V	Refer to3-4
Operating temperature	Topr	-10 to +60	°C	-
Storage temperature	Tstg	-40 to +70	°C	-

Recommended operating conditions

Parameter	Symbol	Rating	Unit	Remark
Supply voltage	VDD	2.7 to 3.3	V	-
GPIO1 High level input	VIH	Min. VDD x 0.7	V	Operating state
GPIO1 Low level input	VIL	Max. VDD x 0.3	V	Stand-by state

3-3. Electro-optical Characteristics

(Ta=25°C, VDD =3V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Measuring distance range	L*	(Note 1)	4	-	50	cm
Output terminal voltage	Vout(A)1	L=50cm (Note 1, 2)	0.3	0.55	0.8	V
Output terminal voltage	Vout(A)2	L=10cm (Note 1, 2)	1.9	2.0	2.1	V
Output terminal voltage	Vout(A)3	L=4cm (Note 1,2)	2.1	2.2	2.3	V
Average supply current	Icc1	L=50cm, GPIO1=VDD	-	26	36	mA
Stand-by supply current	Icc2	GPIO1=GND	-	20	60	μA
Response time (Note 4)	Ts	L=50cm → L=4cm (Note 4)	-	-	40	ms

* L: Distance to reflective object

(Note 1) Under dark condition

(Note 2) Using reflective object :

White paper (Made by Japan Color Research Institute order made color chart : mat, reflective ratio : 90%)

(Note 3) Max. time means that it takes time to stabilize output due to the change of reflected signal light.

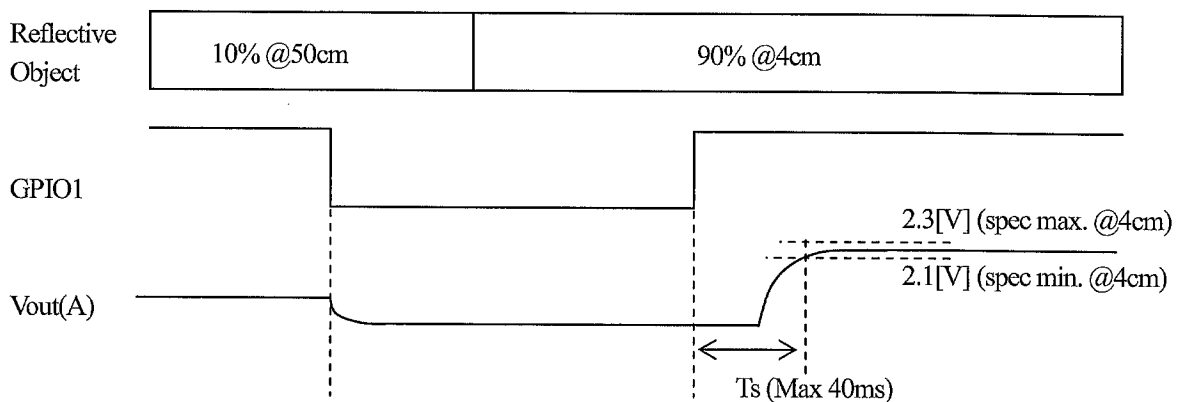
Definition : the case that object condition is changed suddenly from the least reflection(max. gain condition in internal circuit) to the most reflection (min. gain condition in internal circuit).

(Note 4) Method of measuring (Ts)

Connect GPIO1 with GND during measuring L=50cm with reflective object: Gray paper (mat, reflective ratio : 10%).

After changing the position (L=4cm with reflective object: White paper (mat, reflective ratio : 90%),

Measuring the time of the output terminal : Vout(A) until stabilizing .



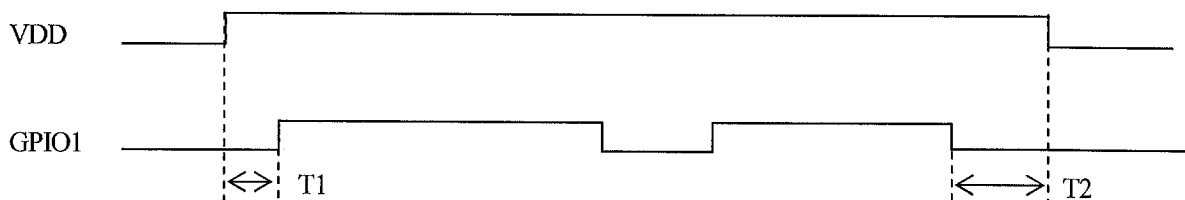
Vout(A) updated every 20ms after response time.

3-4. Active / Stand-by timing sequence

GPIO1 is set High or Low to control Active/stand-by state.

GPIO1=high : Active state

GPIO1=Low : Stand-by state



	Description	Min	Max	Unit
T1	GPIO1 power delay after VDD power on	0	-	ms
T2	GPIO1 leading to VDD power off	0	-	ms

GPIO1 should be set after or at the same time VDD has turned on.

In case that VDD turn off, GPIO1 should be pull low.

If this product is operated under the condition except the above, this product or other device around it may give damage due to excessive current.

4. Reliability

The reliability of products shall be satisfied with items listed below.

Confidence level : 90%

LTPD : 20 or 30

No.	Test Items	Test Conditions	Failure Judgment Criteria	Samples (n) Defective (c)
1	Temperature cycling	1 cycle -40°C to +70°C (30min.) (30min.) 25 cycle test	Initial $x \cdot 0.36 > V_{out}(A)1$ $V_{out}(A)1 > \text{Initial} \cdot 1.64$ (Note 1)	n=11, c=0
2	High temp. and high humidity storage	+40°C, 90%RH, 500h		n=11, c=0
3	High temp. storage	+70°C, 500h		n=11, c=0
4	Low temp. storage	-40°C, 500h		n=11, c=0
5	Operation life (High temp.)	+60°C, VDD=3V, 500h		n=11, c=0
6	Mechanical shock	1000m/s ² , 6.0ms 3times/±X, ±Y, ±Z direction		n=8, c=0
7	Variable frequency vibration	10 to 55 to 10Hz/1min. 2h/X, Y, Z direction overall amplitude : 1.5mm		n=8, c=0

(Note 1) Test conditions are according to 3-3 Electro-optical characteristics.

(Note 2) After test, measurement shall be measured after leaving under the normal temperature and the normal humidity for two hours. But no dew point.

5. Outgoing inspection

(1) Inspection lot

Inspection shall be carried out per each delivery lot.

(2) Inspection method

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	Electro-optical characteristics defect (In para. 3-3)	0.4
Minor defect	Defect on appearance and dimension ※ Crack, chip, scratch, stain	1.0

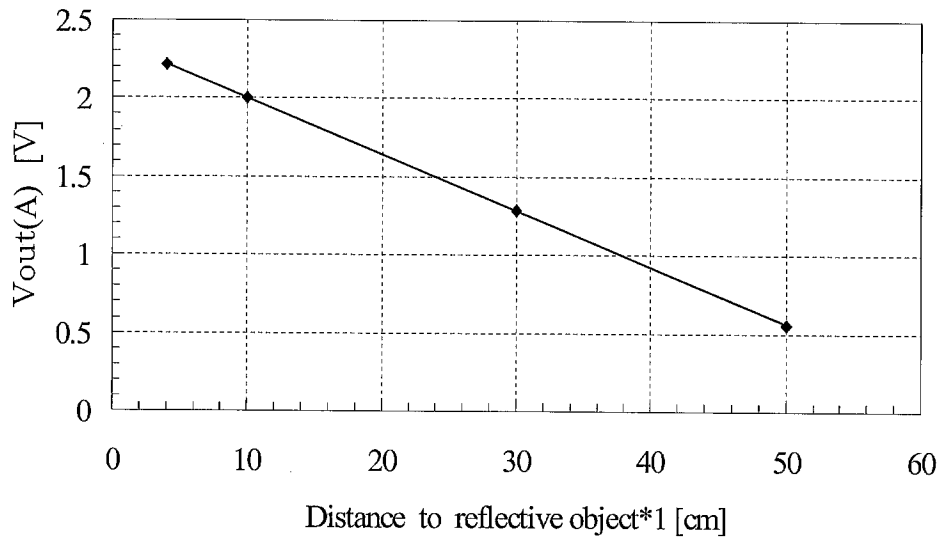
※ Crack, chip, scratch, stain

One which affects the characteristics of para. 3-3 shall be defect.

6. Supplements

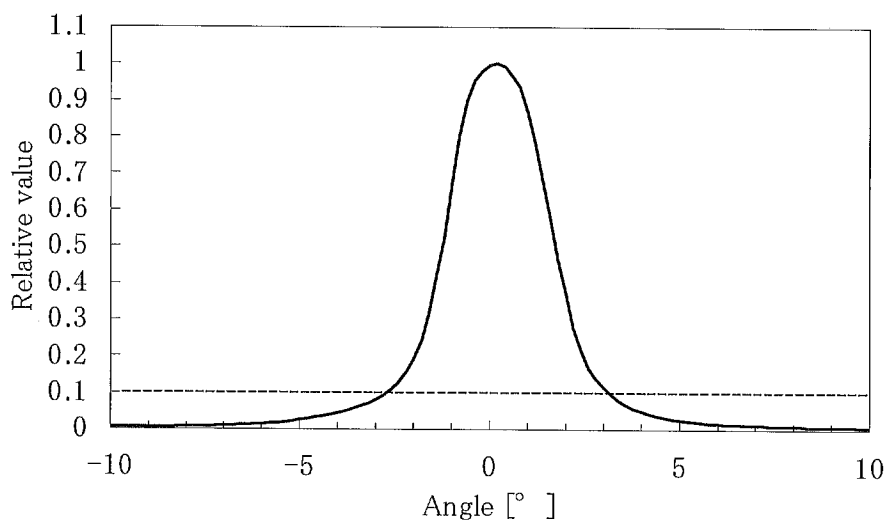
6-1 Example of output distance characteristics

Example of output distance characteristics of GP2Y0E02A



*1 : Using reflective object : White paper (reflective ratio : 90%)

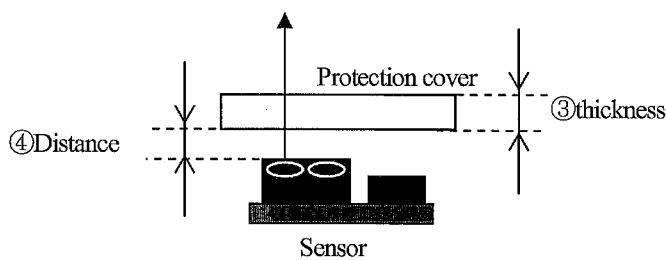
6-2 Example of directional angle of emitting beam



7. Notes

[Advice for the optics]

- 7-1 Lens of this device shall be kept cleanly. There are cases that dust, water or oil and so on deteriorate the characteristics of this device. Please consider in actual application.
- 7-2 In case that protection cover is set in front of this sensor, the protection cover shall be recommended to use material which doesn't scatter light and be matt finish. And the protection cover which has the most efficient transmittance at the emitting wavelength range of LED for this product ($\lambda=850\text{nm}\pm 70\text{nm}$). And this protection cover is recommend to be flat. And this protection cover shall be recommended to be parallel to the emitter and detector portion. In case that protection cover is set in front of this sensor, It emits reflected light from this protection cover. If this reflect light reaches in detector portion, the output distance of this product may be changed. The output distance characteristics of this product may be changed with according to material (①) or transmittance (②) or the thickness (③) or the distance between the protection cover and this product (④) or the angle between surface and back (⑤) or the angle between this cover and this sensor(⑥). In case that protection cover is set, please design to consider that this reflective light is minimized. And it shall be effective to put light shield wall between emitting lens and receiving lens as shown in below.



Fixed reference conditions :

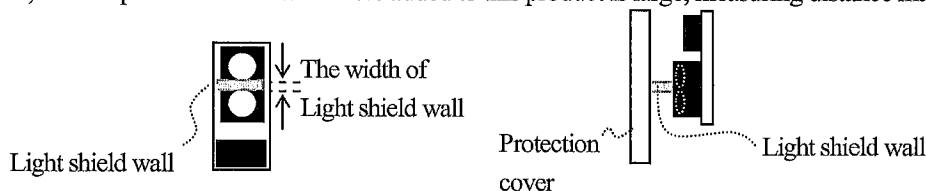
- ①material : acrylic resin
 ②transmittance : >90%@850nm
 ⑤the angle between surface and back : parallel
 ⑥the angle between cover and sensor : parallel
 Cover has the surface finish without light diffusion.

Condition	③thickness	④distance	light shield wall
No1	1mm	0mm	—
No2	1mm	1mm	nonexistence
No3	2mm	0mm	—
No4	2mm	1mm	existence 【*】

Direct reflective light becomes large as Distance from sensor to protection cover and thickness of this cover become large. In case thickness is 2mm and distance is 1mm, measuring distance is changed shift larger from actual distance than other condition. It shifts can make small by using installation of light shield 【*】 and compensation function 【**】 .

【*】 Noted for installation of light shield

Inner distance between lens of detector and lens of emitter is around 0.6mm (reference). So the width of light shield is recommended to be less than 0.6mm. In case the width of light shield is longer than inner distance, measuring distance is changed by Shield a part of emitter lens or detector lens. Please confirm that there is no problem under the actual equipment. And In case between protection cover and light shield or between light shield and this sensor exists space, The effect of light shield is small because light from emitter leaks. The light shield wall is recommended to use the material that have the low transmittance at the emitting wavelength range of LED for this product ($\lambda=850\text{nm}\pm 70\text{nm}$). When the material of light shield wall is hard, and the power stress in which it is added to this product is large, measuring distance may shift from actual distance



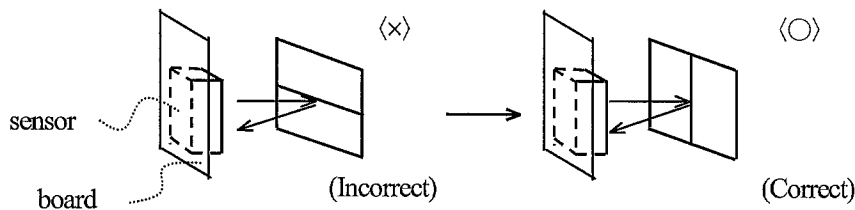
【**】 Noted of compensation function

This product has the function which rectifies error shift by the direct reflective light from protection cover. The accuracy after compensation is based on a protection cover or its installation condition. This function can be active when it set correction factor in this product by E-fuse. Please refer to application manual about the detail of this function. Neither installation of a light shield wall nor use of a compensation function guarantees the distance characteristic. These improve error shift of the distance characteristic.

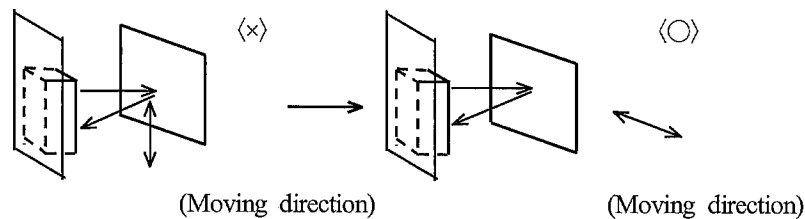
Regardless of use of a light shield wall or a compensation function, please use it after confirming with customer's product.

[Advice for the characteristics]

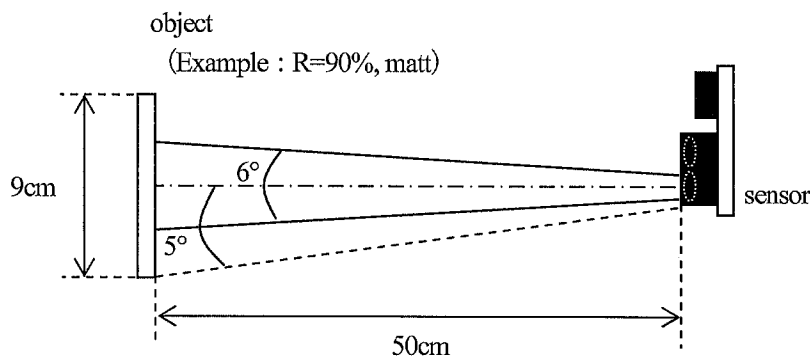
- 7-3 In case that there is an object near to light exits of the sensor between the sensor and the detected object, please use this device after confirming sufficiently what the characteristics of this sensor do not change by the object.
- 7-4 This product has the function to remove disturbance light by the cancellation function of ambient light, a visible light cut lens, etc. But when the detector receive direct light from the sun, tungsten lamp and so on, there are cases that it can not measure the distance exactly. Please consider the design that the detector does not receive direct light from such light source. When you operate the customer's set installing this product by the remote control, please consider soft that the output of this product being disregarded at the time of remote control operation by software.
- 7-5 Distance between sensor and mirror reflector cannot be measured exactly.
- 7-6 In case that reflective object has boundary line clearly, there is cases that distance can not measure exactly. At that time, if direction of boundary line and the line between emitter center and detector center are parallels, it is possible to decrease deviation of measuring distance.



- 7-7 In order to decrease measuring error due to moving direction of object, we recommend to mount the sensor like below drawing.



- 7-8 For satisfying the specification of the electro optical characteristic in 3-3, it is necessary to install a flat surface of object in vertical of emitted light, and it is necessary to reflect the whole emitted light as shown in the following figure. As shown in the 6-2 (example of directional angle of emitting beam), The angle is around $6^\circ (\pm 3^\circ)$ where emission becomes 10% of peaks. The object needs to exist in whole around 10 degrees (± 5 degrees) area including the variation of peak position. For example, when the object is in 50 cm, it is necessary to install the object of at least 9cm diameter parallel to the surface of this sensor as follows. However above example doesn't guarantee specification, please use it after confirming with customer's product.

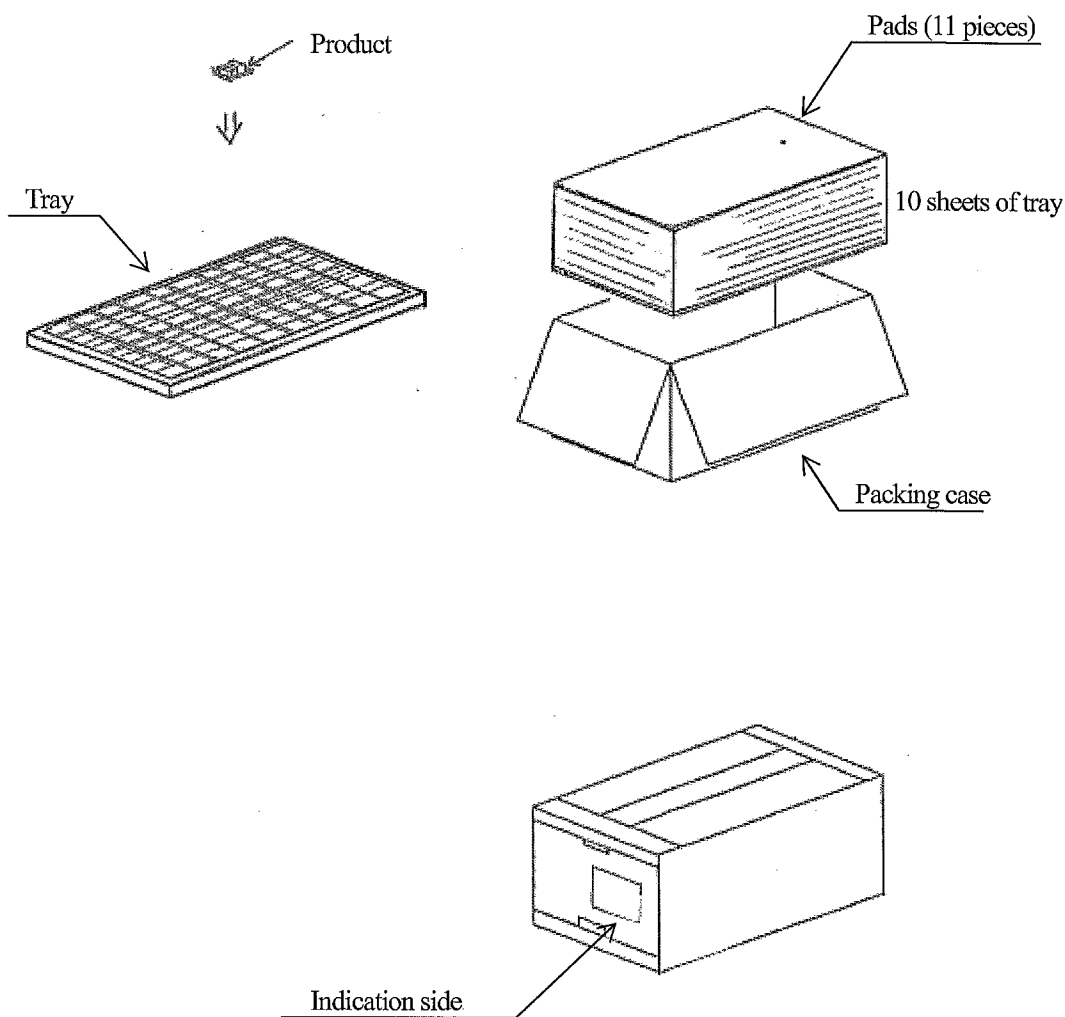


[Notes on handling]

- 7-9 Please don't do washing. Washing may deteriorate the characteristics of optical system and so on.
Please confirm resistance to chemicals under the actual usage since this product has not been designed against washing.
- 7-10 Please use this product under the condition that applied stress to the connector below 0.49N. And, harness is pulled in the state where it attached this sensor, or please be careful so that the stress more than the above may not be added to this sensor.
- 7-11 This product have the parts that mount to the substrate by soldering . Since there is a possibility that a solder mounting part may break when this product is used, the stress more than 4.9N should not be added to this product.

8. Packing specification

(Drawing No. CY15127i09)



- (1) Packing number
Max 100 pieces per tray
Max 1000 pieces per case
- (2) Close the lid of case and seals with craft tape, and fill in the blanks of Model No., quantity and date.
- (3) Outside : 286 x 173 x 105 (mm)
- (4) Indication
The content of the 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