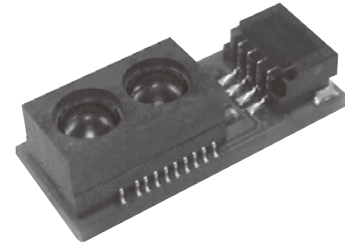


# GP2Y0E02A

Distance Measuring Sensor Unit  
Measuring distance : 4 to 50 cm  
Analog output type



## ■ Description

GP2Y0E02A is a distance measuring sensor unit, composed of an integrated combination of CMOS image sensor and IR-LED.

The variety of the reflectivity of the object, the environmental temperature and the operating duration are not influenced easily to the distance detection because of adopting the triangulation method.

This device outputs the voltage corresponding to the detection distance. So this sensor can also be used as a proximity sensor.

## ■ Features

1. Infrared LED and CMOS image sensor with built-in signal processing circuit
2. Distance measuring range : 4 to 50 cm
3. Low voltage operation : Min 2.7V
4. Compact size (18.9 × 8.0 × 5.2mm)
5. High-precision measurement
6. Analog output type

## ■ Agency approvals/Compliance

1. Compliant with RoHS directive (2002/95/EC)

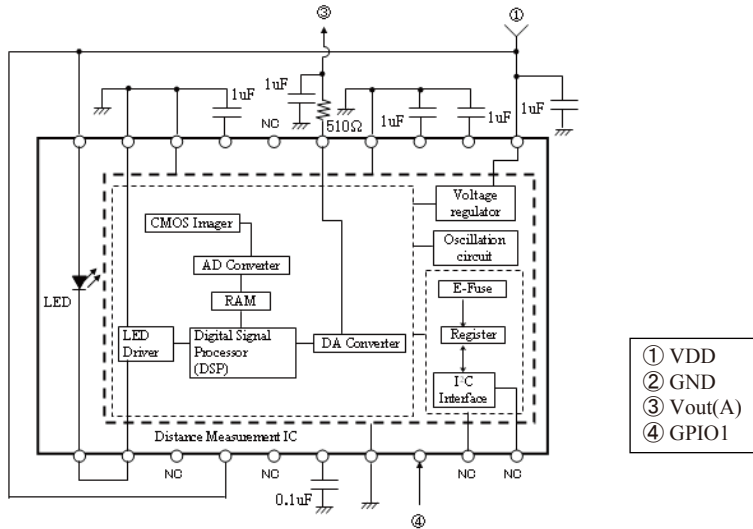
## ■ Applications

1. Cleaning Robot
2. Human type Robot
3. Touch-less switch  
(Sanitary equipment, Control of illumination, etc)
4. Sensor for energy saving  
(ATM, Copier, LCD monitor, etc)
5. Amusement equipment  
(Robot, game machine, etc)

Notice The content of data sheet is subject to change without prior notice.

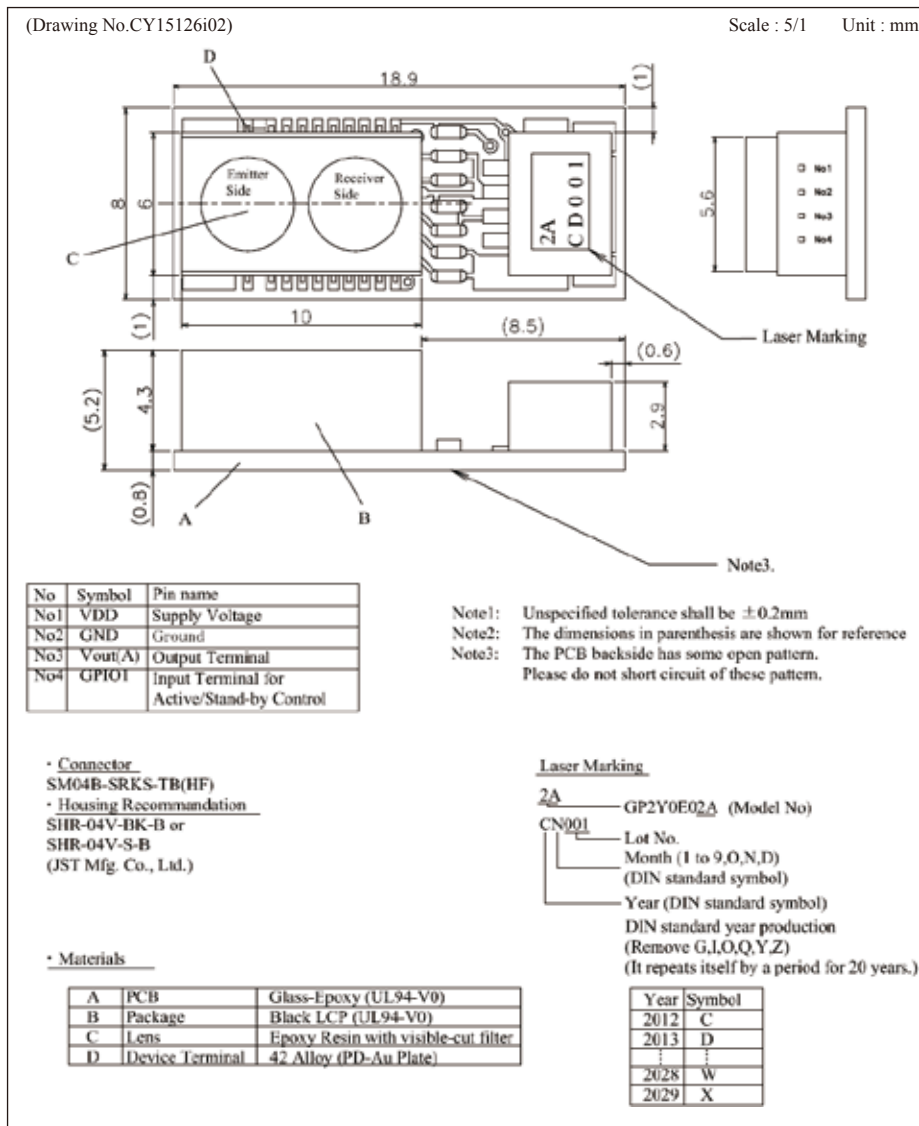
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■ Schematic



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

■ Outline



■ 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 to 3-4 |
| 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  |

■ 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).

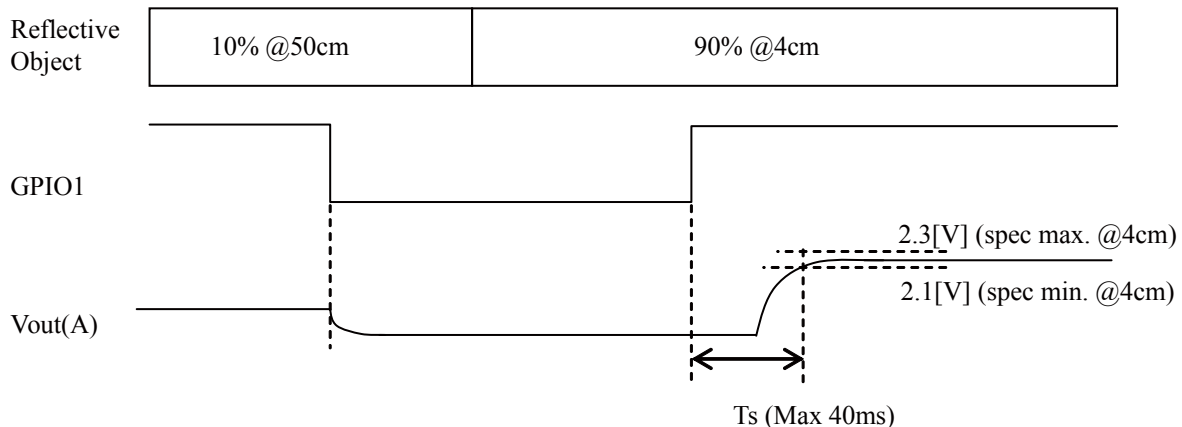
(Note 4) Method of measuring (Ts)

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 .



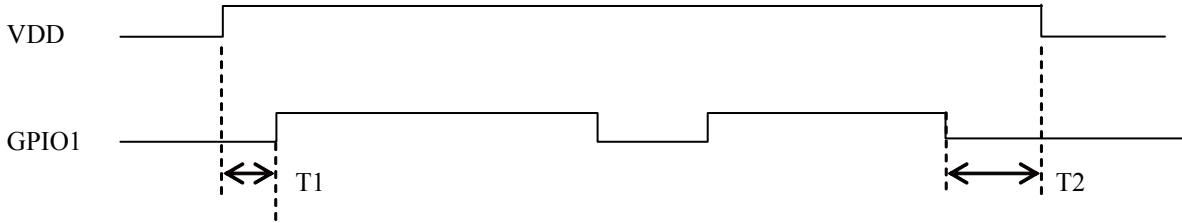
■ Timing Chart

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.

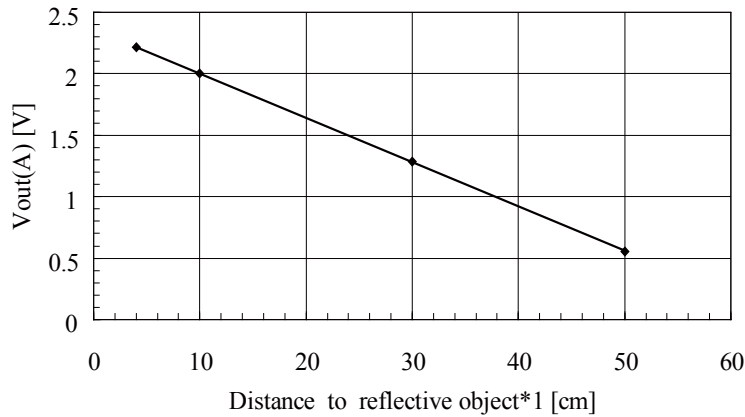
In case that VDD turn off, GPIO1 should be pull low.

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.

■ Supplements

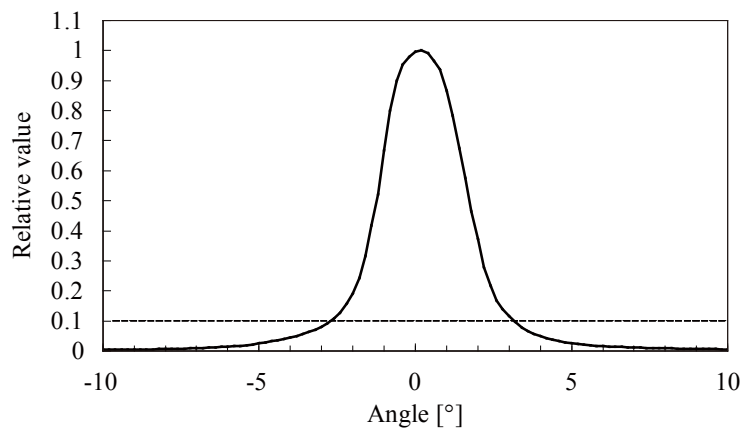
1. Example of output distance characteristics

Example of output distance characteristics of GP2Y0E02A



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

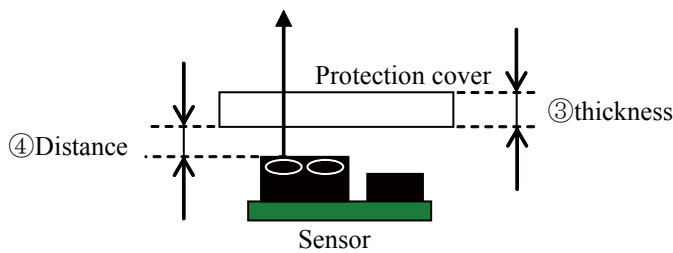
2. Example of directional angle of emitting beam



■ Notes

[Advice for the optics]

- 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.
- 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 :

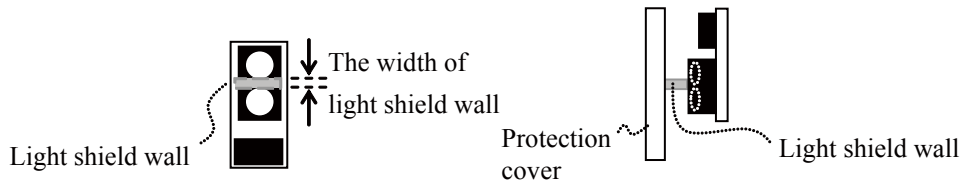
- ①material : acrylic resin
  - ②transmittance :  $>90\%$ @850nm
  - ⑤the angle between surface and back : parallel
  - ⑥the angle between cover and sensor : parallel
- Cover has the surface finish without light diffusion.

| 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.



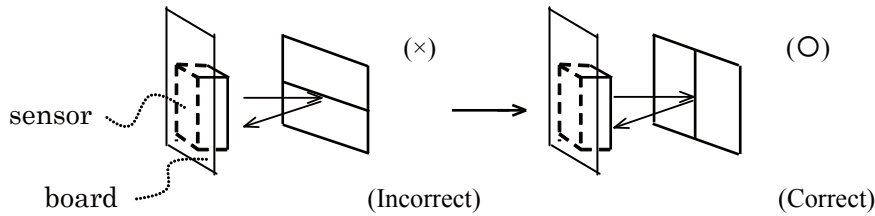
【\*\*】 Noted of compensation function

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.

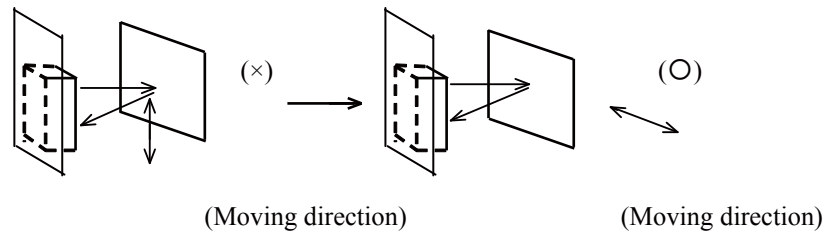
Regardless of use of a light shield wall or a compensation function, please use it after confirming with customer's product.

[Advice for the characteristics]

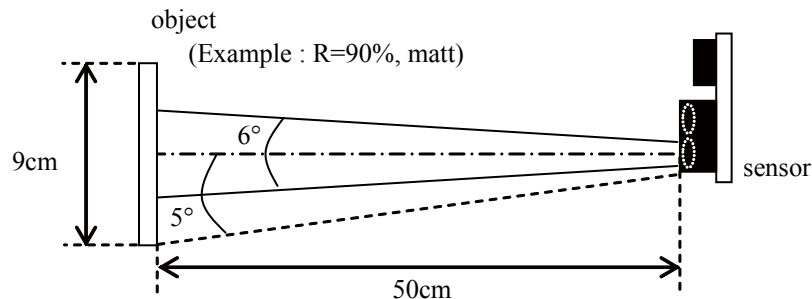
- In case that there is an object near to light exits of the sensor between the sensor and the detected object, please use this device after confirming sufficiently what the characteristics of this sensor do not change by the object.
- This product has the function to remove disturbance light by the 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.
- Distance between sensor and mirror reflector cannot be measured exactly.
- 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.



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



- For satisfying the specification of the electro optical characteristic, 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 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 ( $\pm 5$  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]

- 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.
- 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.
- 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.

■ Compliance with each regulation

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)

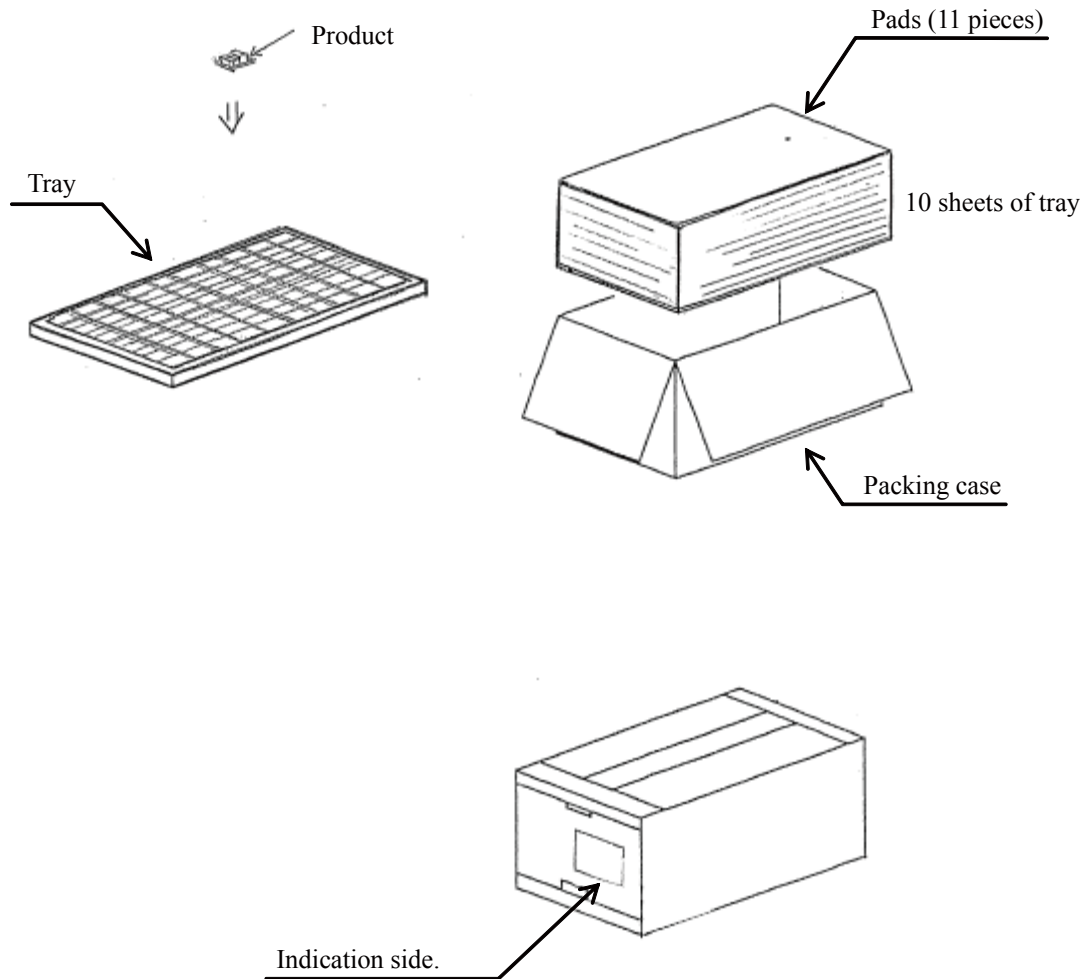
2. Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic Information Products Regulation (Chinese : 电子信息产品污染控制管理办法).

| Category                  | Toxic and hazardous substances |              |              |   |                                |                                       |
|---------------------------|--------------------------------|--------------|--------------|---|--------------------------------|---------------------------------------|
|                           | Lead (Pb)                      | Mercury (Hg) | Cadmium (Cd) | Hexavalent chromium (Cr <sup>6+</sup> ) | Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE) |
| 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 .

## ■ 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



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- Personal computers
- Office automation equipment
- Telecommunication equipment [terminal]
- Test and measurement equipment
- Industrial control
- Audio visual equipment
- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection

with equipment that requires higher reliability such as:

- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
- Traffic signals
- Gas leakage sensor breakers
- Alarm equipment
- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

- Space applications
- Telecommunication equipment [trunk lines]
- Nuclear power control equipment
- Medical and other life support equipment (e.g., scuba).

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