SHARP

SYSTEM DEVICES UNIT
ELECTRONIC COMPONENTS AND DEVICES DEVISION
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

DUST   SENSOR

MODEL No.

GP2Y1023AU0F

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 ☐ copies of the Specifications
with approving signature on each.

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

DATE _Feb. 4, 2015_____

BY _H. Fujino_____

H.Fujino,
Department General Manager of
Development Dept. V
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SHARP CORPORATION

Product name : Dust sensor

Model No. : GP2Y1023AU0F

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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 characteristics of Model No. GP2Y1023AU0F (Dust sensor).

2. Outline
   Refer to the attached drawing No. CY15280i02.

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

4. Reliability
   Refer to the attached sheet, Page 9.

5. Outgoing inspection
   Refer to the attached sheet, Page 10.

6. Supplements

   6-1 Dust density characteristics[Example]:
   Refer to the attached sheet, Page 11.

   6-2 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 (Methylchloroform)

   6-3 Specified brominated flame retardants
   Specified brominated flame retardants (PBB and PBDE) are not used in this device at all.

   6-4 Product mass : Approx. 16g

   6-5 Packaging specification : Refer to the attached sheet, Page 12.

   6-6 Compliance with each regulation
   6.6.1 The RoHS directive(2002/95/EC)
   This product complies with the RoHS directive(2002/95/EC) .
   Object substances: mercury, lead (except for glass of electronic components), cadmium, hexavalent
   chromium, polybrominated biphenyls （PBB） and polybrominated diphenyl ethers （PBDE）
   6.6.2 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)
Dust 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 .

＊ : indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part

exceeds the concentration limit requirement as described in SJ/T 11363-2006 standard.

Lead in glass of electronic components (designated by "＊" in the above table) are exempt from the RoHS directive

(2002/95/EC) , because there is no effective way to eliminate or substitute them by present scientific technology.

7. Notes

7-1 Connection of case and GND

Case material use conductive resin as cover case (printed model No.) and metal (test terminal side)
as bottom cover. The metal case connects with GND in sensor.

7-2 Cleaning

Please don't do cleaning, because there is a case that this device is not satisfied with its
characteristics by cleaning.

7-3 Dust Adhesion

There is a case that this product does not detect the dust density correctly, since the dust adhered to the inside
of the dust through hole may project into the detecting space which consist of emitter and detector
light axis. Please take the structure and mechanism of the equipment into consideration to avoid the
influence of adhered dust. And when the dust is adhered. Please consider the maintenance such as vacuuming
or blowing off the dust by air.
In addition, in case the foreign substance such as dust is attached to the optical system consist of light emitting
diode, light detector, lens and so on, and the inner portion of case, there is a variation in output at no dust of this sensor.
Please make allowance for the error in dust detection based on output at no dust of this sensor.

7-4 Sensitivity adjustment VR

VR for sensitivity adjustment is set up at shipping from Sharp.
Please do not touch the VR or Electro-optical chaeacteristics specified on the specification will be invalid.

7-5 Light output

In circuit designing, make allowance for the degradation of the light emitting diode output that results
from long continuous operation. (50% degradation/5years)

7-6 Resolution

Please do not disassemble the device such as removing a tapping screw and so on.
Even if the device is reassembled, it may not satisfy the specification.

7-7 Application to fire alarm

Please do not use this device for a fire alarm application. When using this device to application other
than air purifying and equipment with air purifying function, please inform us before usage.

7-8 Noise influence

If the sensor is located close to noise source (ex. Electric dust collector, etc.).
The sensor output may be affected by leaded noise.
On top of that noise from power supply line also may affect the sensor output.
When designing the system, please consider the effect from noise.

7-9 Vibration influence

The sensor may change its output value under mechanical oscillation.
Before usage, please make sure that the device works normally in the application.

7-10 Incident light influence

There is a case that the sensor output may be affected when outer-light comes through dust through hole on printed side.
In order to avoid any influence from outer-light, please locate the printed side of the sensor facing to
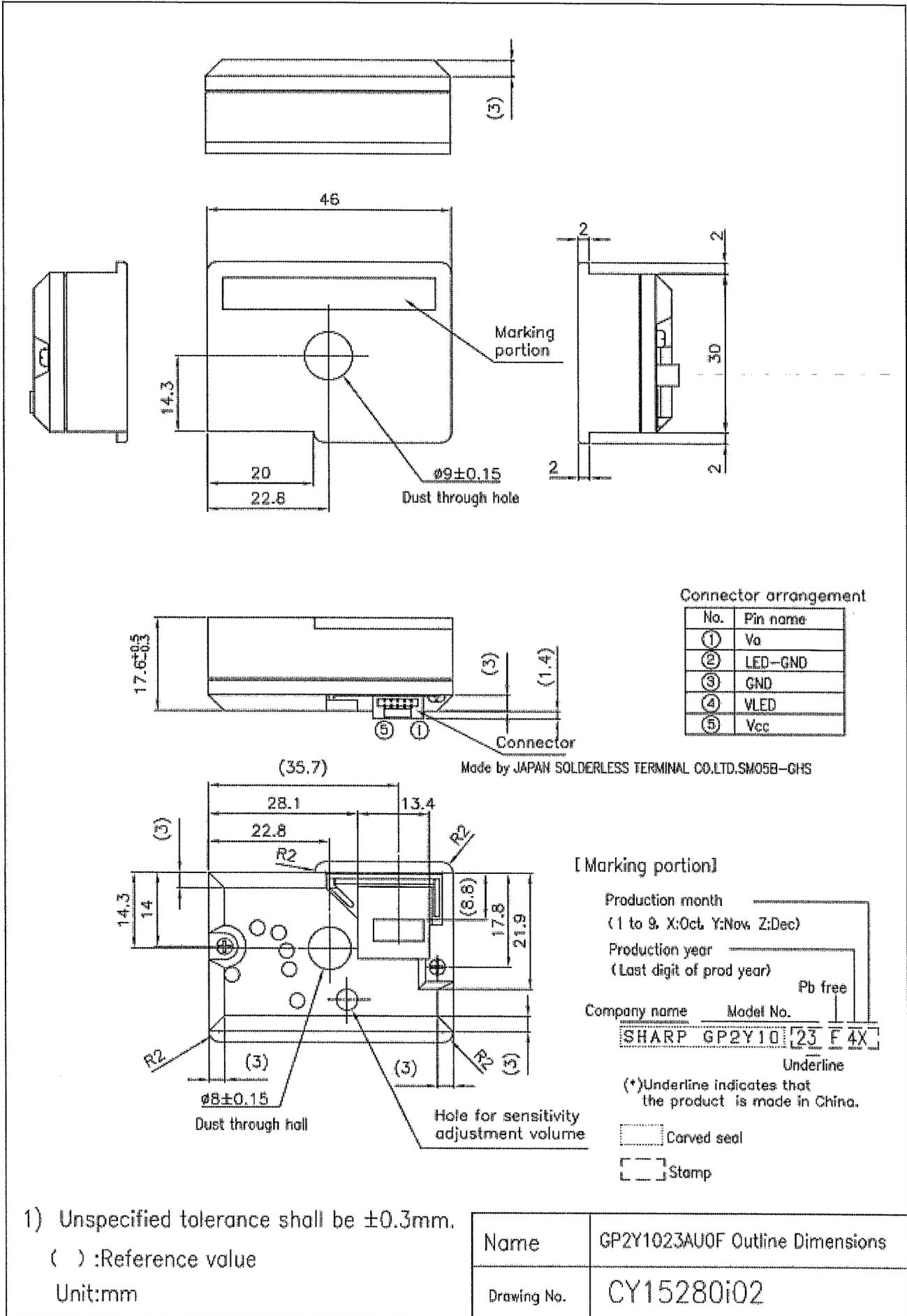inside of the application.

7-11 Dewing

When inside of the sensor is moisturized, this product does not keep its proper function.

Please design the application so that moisturization of the sensor does not happen.

7-12 VLED/LED-GND peripheral circuit.

Depending on the type of capacitor (220 μ F) within VLED/LED-GND peripheral circuit and the length or the gauge of line from the capacitor (220 μ F) to this sensor, there is a possibility for variation in current supplied to the light emitting diode. Before usage, please make sure that the output at no dust of this sensor is normal in the application.

GP2Y1023AU0F (ED-14G011A)

2. Outline

46

⌀9±0.15
Dust through hole

Marking portion

2

30

2

2

14.3

20

22.8

17.6±0.5

(35.7)

28.1

13.4

22.8

R2

R2

14.3

14

17.8

21.9

(8.8)

R2

R2

(3)

(3)

(3)

(3)

⌀8±0.15
Dust through hall

Hole for sensitivity
adjustment volume

(3)

(1.4)

⑤ ①

Connector
Made by JAPAN SOLDERLESS TERMINAL CO.LTD.SM05B-GHS

Connector arrangement

No.	Pin name
①	Vo
②	LED-GND
③	GND
④	VLED
⑤	Vcc

[Marking portion]

Production month
(1 to 9, X:Oct, Y:Nov, Z:Dec)

Production year
(Last digit of prod year)

Pb free

Company name   Model No.

SHARP GP2Y10 23 F 4X

Underline

(*)Underline indicates that
the product is made in China.

⬚ Carved seal

⌐¬ Stamp

1) Unspecified tolerance shall be ±0.3mm.
   ( ):Reference value
   Unit:mm

Name	GP2Y1023AU0F Outline Dimensions
Drawing No.	CY15280i02

3. Ratings and characteristics

3-1 Constitution diagram
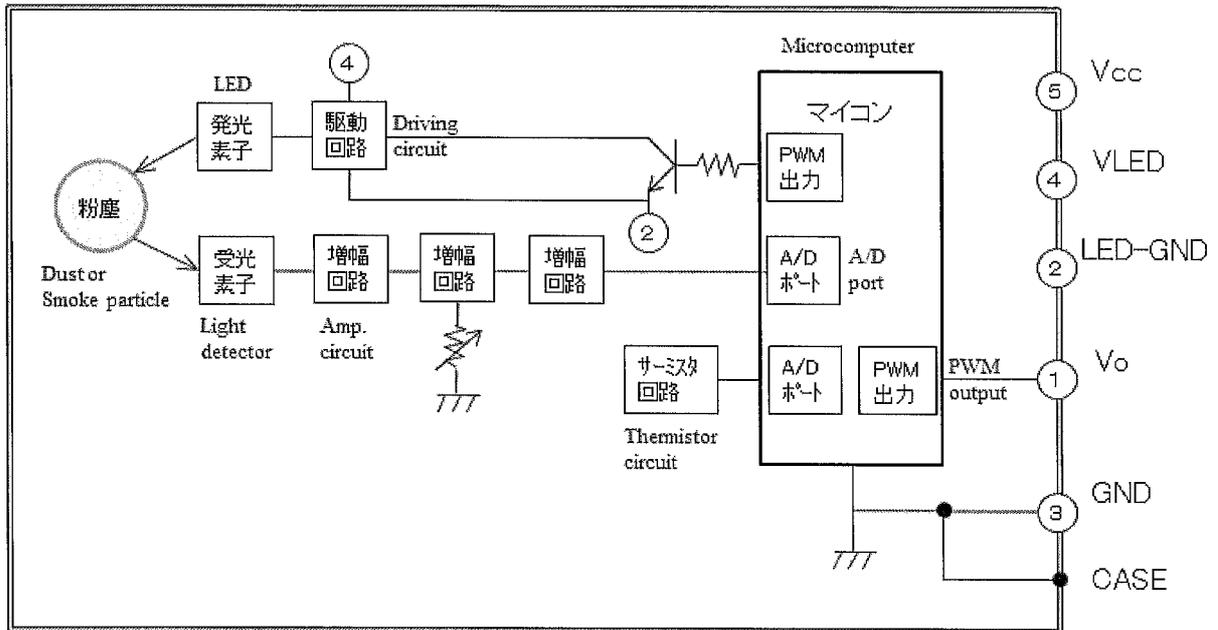
3-2 Absolute maximum ratings

(Ta=25℃)

Parameter	Symbol	Rating	Unit	Remark
Supply voltage	Vcc	-0.3 to +6	V	—
Input terminal voltage	V_{LED}	-0.3 to Vcc	V	—
Operating temperature	Topr	-10 to +65	℃	—
Storage temperature	Tstg	-20 to +80	℃	—

3-3 Operating Supply Voltage

Symbol	Rating	Unit	Remark
Vcc	5±0.25	V	—

3-4 Electro-optical Characteristics

(Ta=25°C, Vcc=5V)

| Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output terminal voltage	VoH	Output voltage at High-level	Vcc-1.5	-	-	V
	VoL	Output voltage at Low-level	-	-	1.3	V
Output pulse cycle	T		9.8	10.0	10.2	ms
Sensitivity	K	(*1)(*2)(*3)(*4)	1190	1400	1610	$\mu s /$ $(100 \mu g/m^3)$
Output at no dust	Voc	(*2)(*3)(*4)	1250	1400	1550	μs
Output range	VOHH	(*2)(*3)(*5)	3780	-	-	μs
Average supply current	ICC	(*3)	-	15	25	mA

(*1) Dust density shall be measured the density of MEVIUS (made by Japan Tobacco Inc.) by using a digital dust indicator P-5L2 (made by SIBATA SCIENTIFIC TECHNOLOGY LTD.).

Sensitivity : K shall be specified about output change when dust density is changed $100 \mu g/m^3$

(*2) Sensor output Vo is a digital output with its pulse width converted from A/D conversion value of built-in amplified output.

The detail of Sensor output Vo is defined in para.3-4-1.

(*3) Capacitor C & resister R of value shown below must be connected in peripheral circuit.
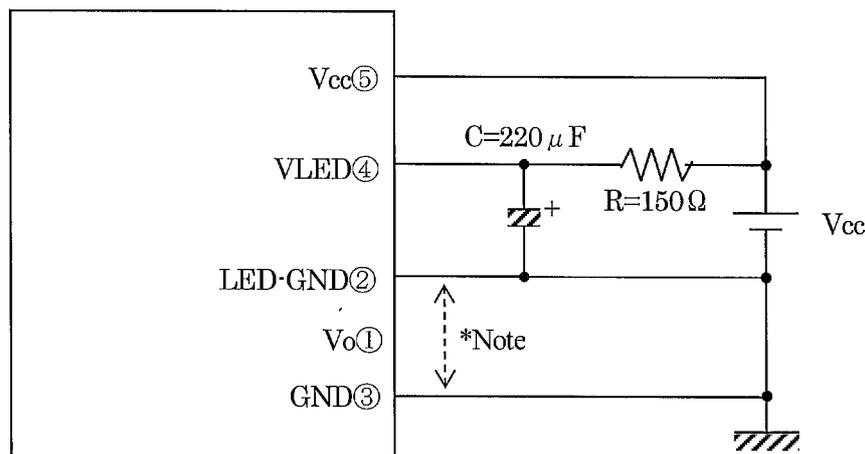
*Note : LED-GND line and GND line must be separated.

(*4) Averaged value of 100 times measured.

(*5) This value is a value at which the output of built-in amplifier becomes saturated.

3-4-1 The detail of Sensor output Vo

Sensor output Vo is a digital output with its pulse width converted from A/D converted value shown below.

Sensor output Vo : PWM output of (A/D values of amplified voltage

- A/D values of initial value + A/D values of 1V)
(*) A/D values of initial value = A/D value of amplified voltage at no dust is memorized
in built-in microcomputer

After power-on, sensor output Vo is Hi-level for 1sec. Then, sensor output Vo is a digital output with its pulse width W converted from A/D value of change.
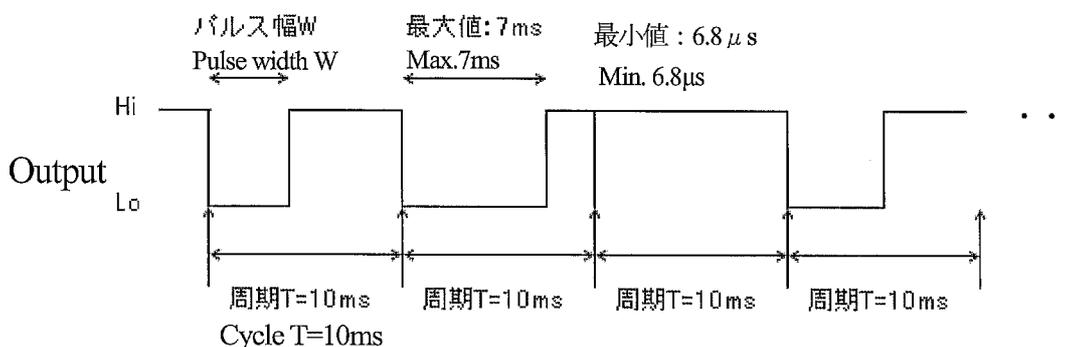
The pulse width follows rules shown below.
- If A/D value is 1023(equivalent to 5V), pulse width is 7ms (Duty=70%).
- If A/D value is 1(equivalent to 4.9mV(=5V/1023)), pulse width is (7/1023)ms equivalent to 6.8μs.
- If A/D value is 0, pulse width is treated as if A/D value is 1.

[Output for failure decision]
In the following cases, sensor output Vo becomes only Hi-level.
- If A/D value (temperature-corrected value) is less than 1/10 times of initial A/D value (temperature-corrected value), the state of this sensor is determined as failure.

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)
	Temperature cycling		$L \times 0.8 > K$ $K > U \times 1.2$ $L \times 0.8 > Voc$ $Voc > U \times 1.2$	n=11, c=0
2	High temp. and high humidity storage	+60℃, 90%RH, 500h		n=11, c=0
3	High temp. and high humidity operation	+60℃, 90%RH, Vcc=5V, 500h		n=11, c=0
4	High temp. storage	+80℃, 500h	U : Upper specification limit L : Lower specification limit	n=11, c=0
5	High temp. operation	65℃, Vcc=5V, 500h		n=11, c=0
6	Low temp. storage	-20℃, 500h		n=11, c=0
7	Low temp. operation	-10℃, Vcc=5V, 500h		n=11, c=0
8	Mechanical shock	1000m/s², 6.0ms 3times/±X, ±Y, ±Z direction		n=8, c=0
9	Variable frequency Vibration	5 to 55 to 5Hz/1min. overall amplitude : 1.5mm 2h/X, Y, Z direction		n=8, c=0

*1   Test conditions are according to 3-4 Electro-optical characteristics.

*2   After test, measurement shall be done after leaving under the normal
temperature and the normal humidity for 2h. And there should be no dew.

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 shall be adopted.

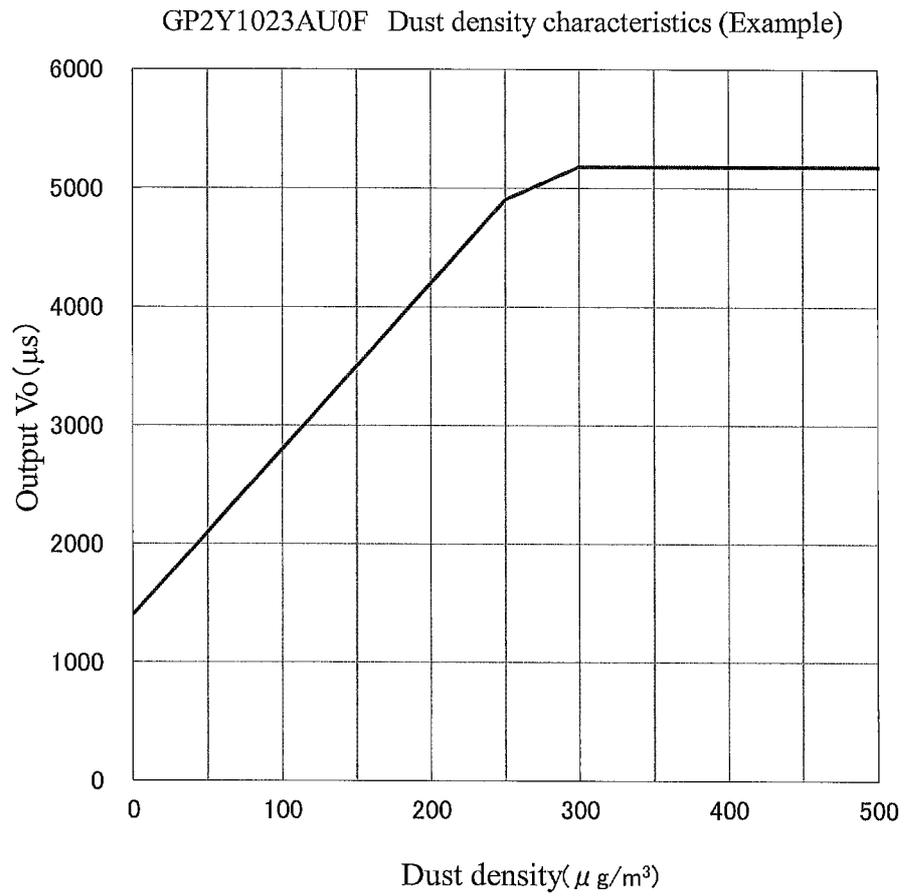| Defect	Inspection item	AQL (%)
Major defect	Electro-optical characteristics defect (In para. 3-4)	0.4
Minor defect	Defect on appearance and dimension ※ Split, chip, scratch, stain	1.0

   ※ Split, chip, scratch, stain
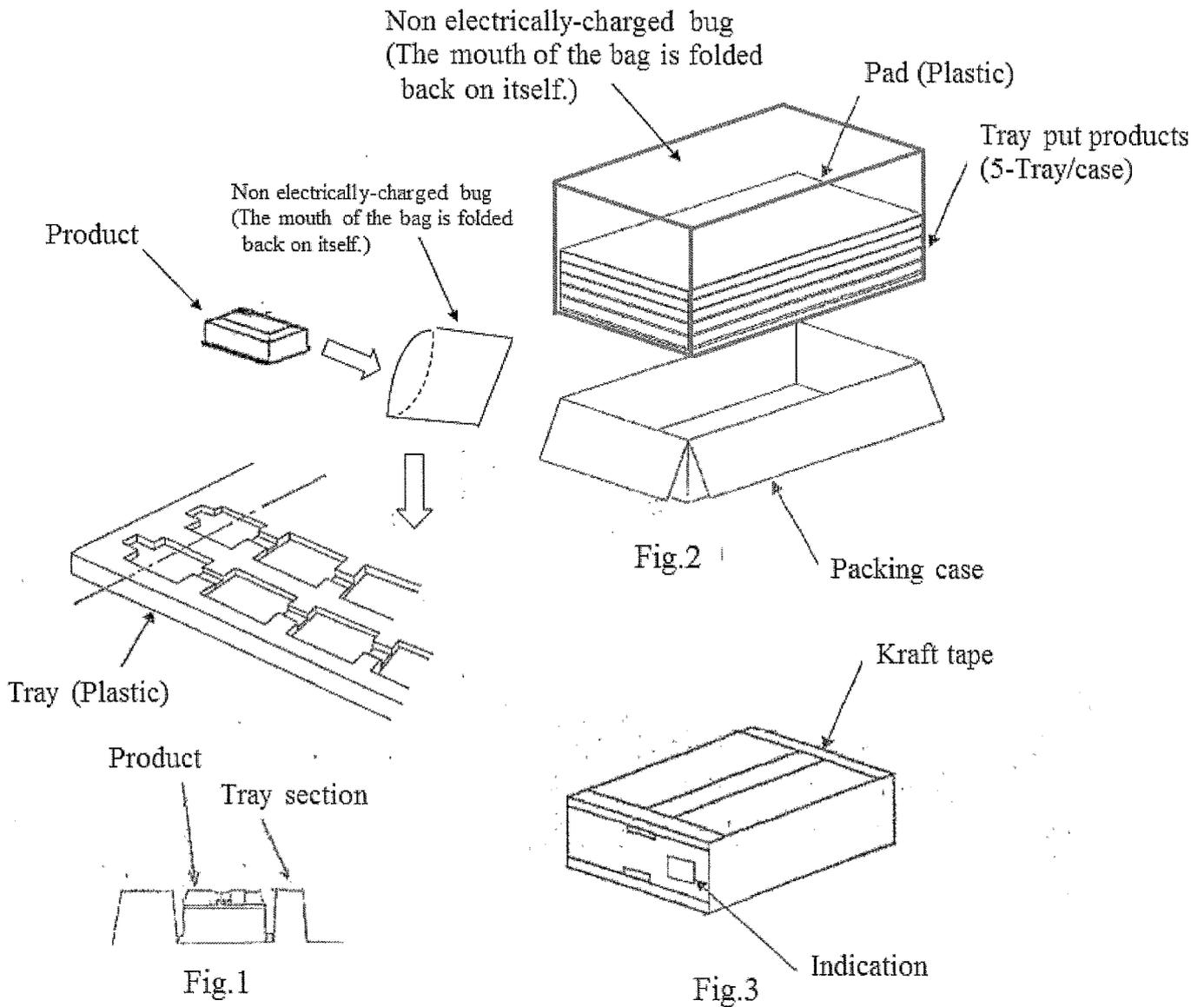   One which affects the characteristics of para. 3-4 shall be defect.
   ※ Rust shall not be defect.

GP2Y1023AU0F (ED-14G011A)

6-1 Dust density characteristics[Example]

Test conditions are according to 3-4 Electro-optical characteristics.

GP2Y1023AU0F Dust density characteristics (Example)

Dust density(μ g/m³)

6-5 Packaging specification

Non electrically-charged bug
(The mouth of the bag is folded
back on itself.)

Pad (Plastic)

Tray put products
(5-Tray/case)

Product

Non electrically-charged bug
(The mouth of the bag is folded
back on itself.)

Fig.2

Packing case

Tray (Plastic)

Product

Tray section

Kraft tape

Fig.1

Indication

Fig.3

Packaging method

1. Put product in non electrically-charged bug and put products of 50pcs in tray.
   Packing methode is showed in the above fig. (Fig.1)
2. Put 5 trays above in non electrically-charged bug.
   Pave the pad between the top and bottom and each steps. (Fig.2)
3. Put them (5 trays) in the packing box.
   Seal the packing box with kraft tape. (Fig.3)
4. 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

(250pcs/a packing box. Formal packed mass :Approximately 5.6kg)

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