GP2AP030A00F

Proximity Sensor with
Ambient Light Sensor

■Description

GP2AP030A00F integrates a proximity sensor and
an ambient light sensor in one package.
So small package size, it is easy to mount on the
equipment.
It has a closest light spectral sensitivity to human eye
responses.

■Agency approvals/Compliance

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

■Applications

1. Mobile phone
2. Smartphone, Tablet
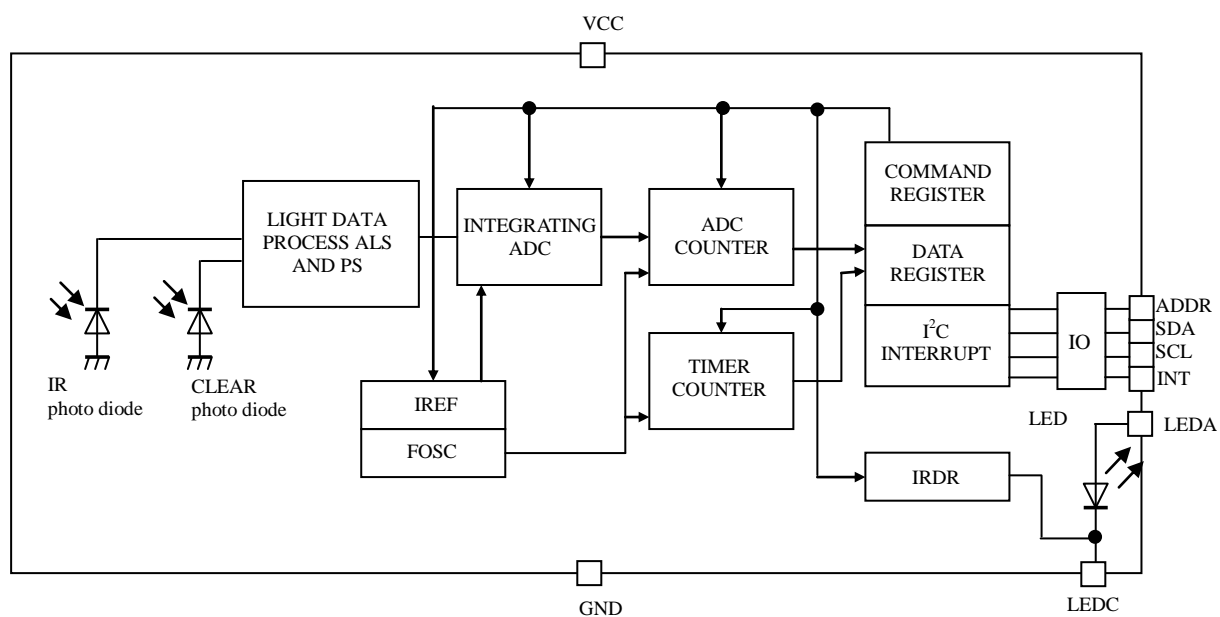3. Digital single-lens reflex camera

■Features

1. LED and ambient light sensor combined in a signal
   package ($4.0 \times 2.0 \times 1.25t$ mm)
   Built-in LEDs for simple optical design
2. Illuminance output : digital 16bit output
   (Minimum detectable illuminance : 0.02lx)
3. I^2C output compatible
   (Proximity sensor, Ambient light sensor)
4. Detecting distance [*1]: Typ.100mm
   ([*1] ILED=130mA , Gray Card (white side))

Sheet No.: OP13006EN

■ Block diagram

■Outline Dimensions

(Drawing No. CY15022i02)

Direction identification mark

Detector

IR Emitter

This laser making means

Model Number
※ 3
Model Type
※A to Z

This laser making means

Month(1 to 9,X to Z)
※X to Z=10 to 12
Day(1 to 9, A to Y)
※A to Y=10 to 31

Charts of the day

10	11	12	13	14	15
A	B	C	D	E	F
16	17	18	19	20	21
G	H	J	K	L	M
22	23	24	25	26	27
N	P	Q	R	S	T
28	29	30	31		
V	W	X	Y		

Pin assignment (Top View)

Pin	Pin name	Symbol
①	LED Anode	LEDA
②	I2C Clock	SCL
③	Interrupt	INT
④	I2C Data Bus	SDA
⑤	Supply Voltage	VCC
⑥	Address	ADDR
⑦	Ground	GND
⑧	LED Cathode	LEDC

1) ▨▨▨ area : Au plating
2) Unspecified tolerance shall be ±0.2.

SCALE	MATERIAL	FINISH	Name	GP2AP030A00F
10/1	Terminal: Cu	Terminal: Ni(≧3μm), Au(≧0.1μm)		Outline dimension
UNIT	Package : Epoxy resin			
1 = 1/1 mm			DRAWING No.	C Y 1 5 0 2 2 i 0 2

■Absolute Maximum Ratings

Ta=25°C (unless otherwise specified)

Parameter	Symbol	Rating	Unit	Remarks
Power supply voltage	VCC	-0.3 to 5.7	V	
LED voltage	VLED	-0.3 to 5.7	V	
I^2C voltage	VI^2C	-0.3 to 5.7	V	
Operating temperature	Topr	-35 to 85	°C	
Storage temperature	Tstg	-40 to 85	°C	
Soldering temperature	Tsol	250	°C	peak temperature duration:10s

■Recommended Operating Conditions

Ta=25°C (unless otherwise specified)

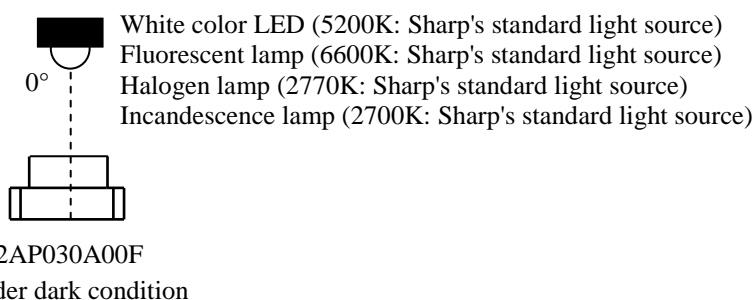| Parameter	Symbol	Operating condition	Unit	Remarks
Power supply voltage	VCC	2.2 to 5.5	V	
LED voltage	VLED	2.2 to 5.5	V	
I^2C voltage	VI^2C	1.7 to VCC	V	
Operating temperature	Topr	-35 to 85	°C	
SCL, SDA input low level	VIL	-0.3 to 0.54	V	
SCL, SDA input high level	VIH	1.26 to VI^2C+0.2	V	

■Electrical and Optical Characteristics

Ta=25°C, VCC=VLED=VI^2C=3.0V

(unless otherwise specified. The external circuit constants follow the recommended external circuit of page 7.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Current consumption (ALS)	I_{CC_ALS}	-	65	95	µA	OP[1:0]=01
Current consumption (PS)	I_{CC_PS}	-	55	85	µA	OP[1:0]=10
Current consumption (Power Down)	I_{CC-S}	-	-	5	µA	OP[3]=0
Internal Oscillator Frequency	fosc	490	655	910	kHz	
I^2C clock frequency	f	1	-	400	kHz	
SDA output low level voltage	V_{OL_SDA}	0	-	0.4	V	I_{OL_SDA}=3mA
INT output low level voltage	V_{OL_INT}	0	-	0.4	V	I_{OL_INT}=3mA
ADC Conversion Time	Tint	72	100	134	ms	
Full scale ADC code	Data_F	-	-	65535	counts	
Dark count_ALS	Data_0	-	0	3	counts	RES_A[2:0]=011 RANGE_A[2:0]=011, Ev=0 lx
ADCCODE_ALS1	Data_A1 CLEAR	928	1687	2446	counts	RES_A[2:0]=100, RANGE_A[2:0]=011,at 1000 lx, White color LED 5200K *1
	Data_A1 IR	297	540	783		
Detection distance	Lon	58	100	142	mm	RES_P[2:0]=011, RANGE_P[2:0]=010, IS[1:0]=11,LTH=8, Detection Object: KODAK Gray Card (white side) *2
Dark count_PS	Data_0PS	-	-	4	counts	RES_P[2:0]=011, RANGE_P[2:0]=010, IS[1:0]=11,LTH=8, Without Detection Object
Proximity saturation illumination	Ps	-	1000	-	lx	RES_P[2:0]=110, RANGE_P[2:0]=010 *3

Ta=25°C, VCC=VLED=VI^{2}C=3.0V

(unless otherwise specified. The external circuit constants follow the recommended external circuit of page 7.)
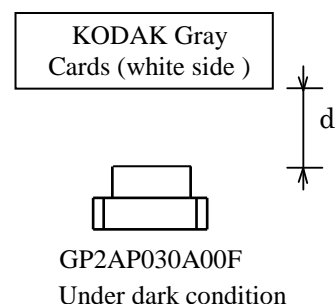
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
LED modulation frequency	fLED	245	327.5	455	kHz	FREQ=0
LED peak wavelength	λ_{P_PS}	-	940	-	nm	
LED peak current *4	I_{LED1}	-	16.3	-	mA	IS[1:0]=00
	I_{LED2}	-	32.5	-	mA	IS[1:0]=01
	I_{LED3}	-	65	-	mA	IS[1:0]=10
	I_{LED4}	-	130	-	mA	IS[1:0]=11

Typical value is a reference value, there is no guarantee

*1.   ALS   *2.   Detection distance

White color LED (5200K: Sharp's standard light source)
Fluorescent lamp (6600K: Sharp's standard light source)
Halogen lamp (2770K: Sharp's standard light source)
Incandescence lamp (2700K: Sharp's standard light source)

0°

KODAK Gray
Cards (white side)

d

GP2AP030A00F   GP2AP030A00F

Under dark condition   Under dark condition

*3.   Test set-up for "Proximity saturation illumination" measurement

GP2AP030A00F

Light source A

Emitter/Detector surface
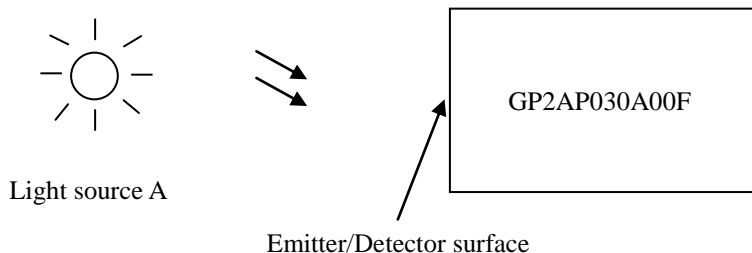
Illuminance should be measured and evaluated at Emitter/Detector surface of GP2AP030A00F.
Proximity saturation illumination , the intensity is saturated when the count value of the proximity mode
GP2AP030A00F above measurement systems.
If external light noise illumination exceeds proximity saturation illumination, GP2AP030A00F may not be
detected even if there is a reflective object.

*4.   Duty of LED

	OP[1:0]=11	
INTVAL[1:0]	FREQ=0	FREQ=1
00	25.0%	6.3%
01	8.3%	2.1%
10	5.0%	1.3%
11	2.8%	0.7%

■Supplement

● This product is built-in photodiode.
● Brominated flame retardants
  Specific brominated flame retardants such as the PBB and PBDE are not used in this device at all.
● 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)
● 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, 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^{6+})	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
proximity/ambient light 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 .
● Product mass : Approx . 0.017 g

■Notes

- ●Notes concerning receiver surface

    Please note that it is likely to malfunction when a receiver surface is dirty with garbage and dust, etc. enough. Moreover, please do not touch a receiver surface.

- ●For cleaning

    Cleaning shall carry out as the below items to avoid keeping solvent, solder and flux on the device.

    ・Solvent cleaning : Solvent temperature 45°C or less, Immersion for 3 min or less

    ・Ultrasonic cleaning : Please don't carry out ultrasonic cleaning.

    ・The cleaning shall be carried out with solvent below.

        Solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

- ●Please take proper methods to prevent ESD. The IC built in GP2AP030A00F is ESD-sensitive because it is fabricated by sub-micron CMOS process. For example, in handling GP2AP030A00F, human body and soldering iron etc. should be grounded.

- ●Before the 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)

- ●Notes ambient light

    Proximity mode when set to avoid malfunctions due to a strong disturbance light, such an arrangement to receive ambient light Directly on the detector, please be avoided. Also by placing this product in close proximity to other components, it may be a malfunction with the light reflected from their product, structural arrangement to reduce the amount of light receiving surface of the outer, please consider.
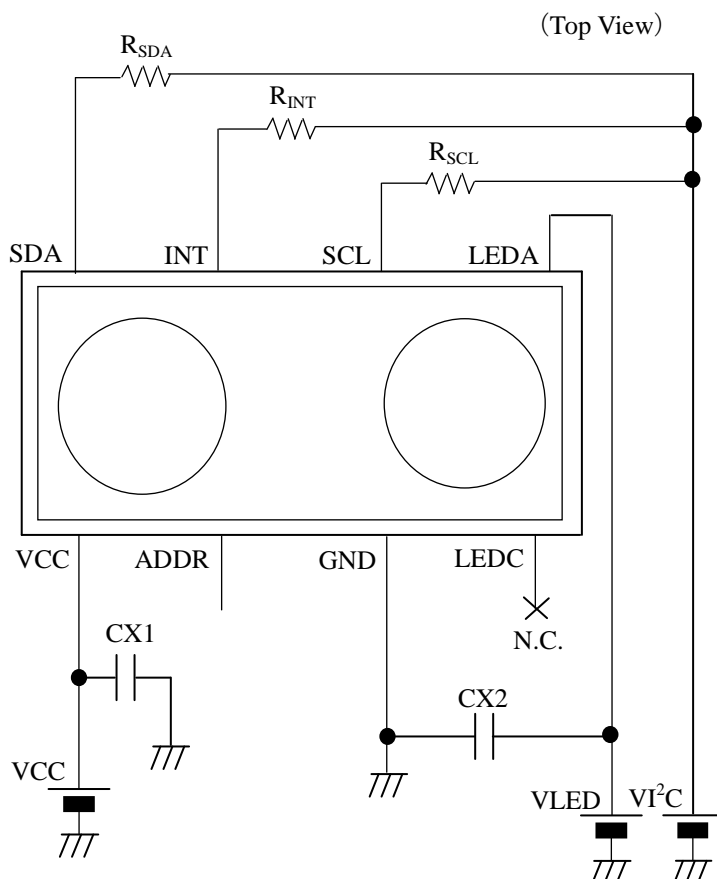
- ●Notes external force

    After being mounted and soldered, if GP2AP030A00F is deformed by external force or impact, e.g. something falls onto the device, it may result in defective implementation such as lift-off of the terminals. Careful handling should be taken.

- ●For soldering

    Refer to Page 9.

- ●Recommended external circuit

（Top View）

Components	Recommended values
CX1	1μF
CX2	2.2μF
R_{SDA}	10kΩ
R_{SCL}	10kΩ
R_{INT}	100kΩ

There are cases to generate a noise because LED driving current flows LEDA terminal, and to distort a waveform of LED driving current.

To reduce these influences, please arrange CX2 within 5mm from LEDA terminal, and wire between LEDA terminal, CX2 and GND terminal as close as possible. Also, the wiring of VLED is separated from VCC and VI^2C terminals , and The power souce of VLED is separated from VCC is recommended.

And in order to reduce the influence of the power supply noise, please arrange CX1 within 5mm from VCC terminal.
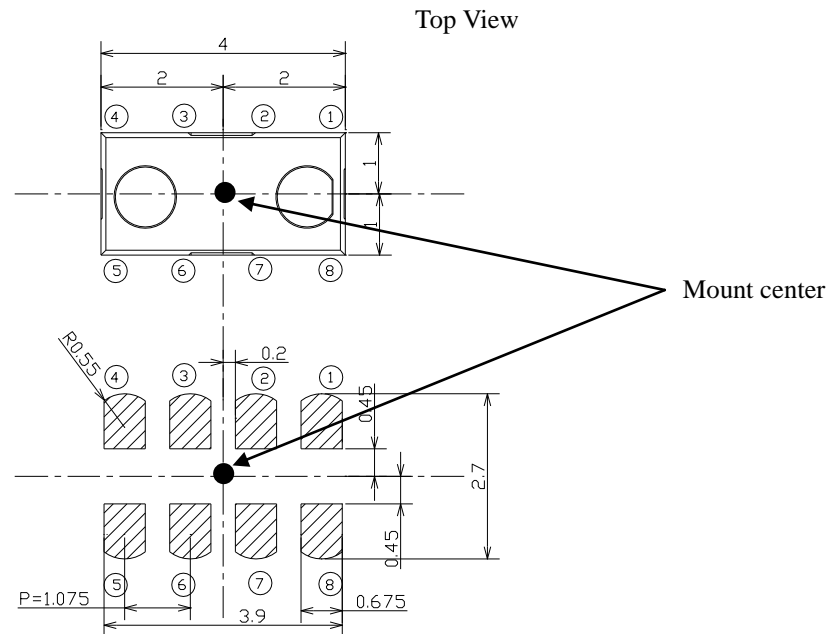
Please evaluate with the actual electrical implementation, and carefully make sure that there is no problem.

SDA terminal (as output) and INT terminal are NMOS open-drain output.

N.C. pin (LEDC) must be held open (disconnected).

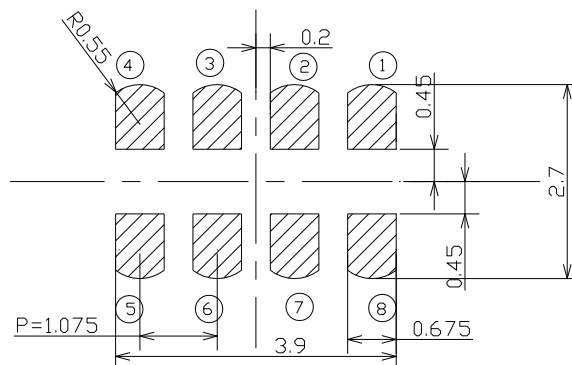●Foot pattern of PCB
    (1)   Dimensions are shown for reference.

Top View

Mount center

1. Dimension in parenthesis are shown for reference.

2. Unit : mm

Pin	Pin name	Symbol
①	LED Anode	LEDA
②	I^2C Clock	SCL
③	Interrupt	INT
④	I^2C Data Bus	SDA
⑤	Supply Voltage	VCC
⑥	Address	ADDR
⑦	Ground	GND
⑧	LED Cathode	LEDC

    (2)   Recommendable size of solder creamed paste (Reference)

: Soldering paste area
   * Dimensions in parenthesis are shown for reference.
      Unit : mm

■Precautions for Soldering

1. In case of solder reflow

Reflow is allowed only three at the temperature and the time
within the temperature profile as shown in the figure below.
This Profile temperature is the sensor surface package temperature.
Reflow interval shall be within 7days under conditions, 10 to 30°C, 70%RH or less.
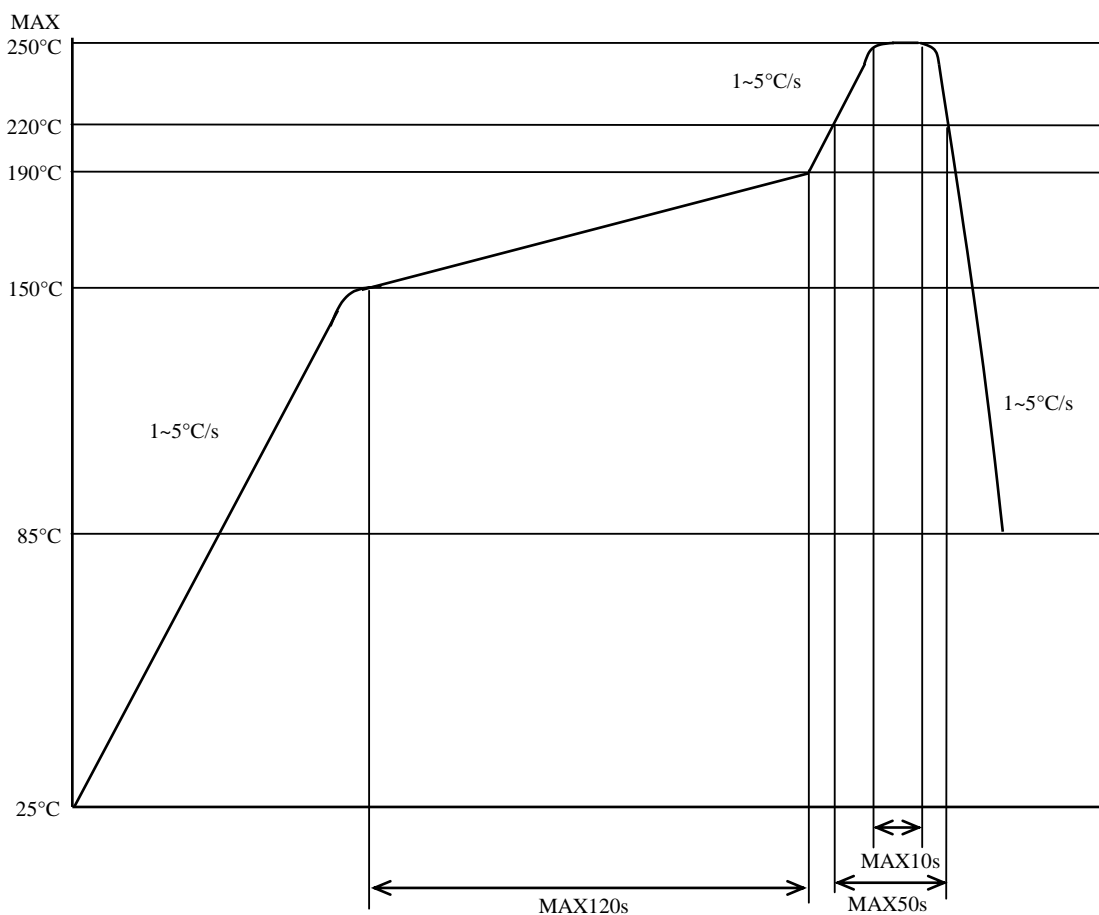
2. Other precautions

An infrared lamp used to heat up for soldering may cause a localized temperature rise in the resin.
Also avoid immersing the resin part in the soldering.
Even if within the temperature profile above, there is the possibility that the gold wire in package is broken
in case that the deformation of PCB gives the affection to lead pins.
Please use after confirmation the conditions fully actual solder reflow machine.

■Packing

Inner Packing
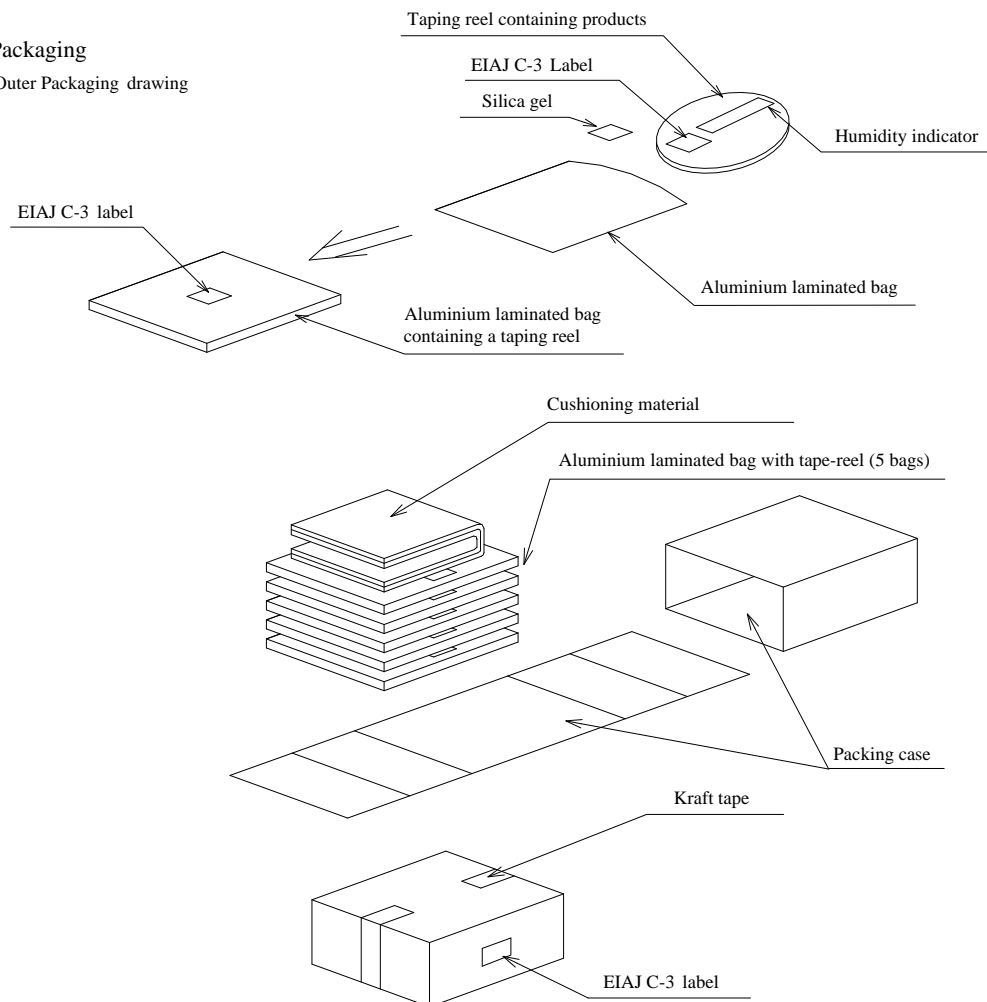
   ① Inner Packaging drawing

Cover tape   2,000pcs products
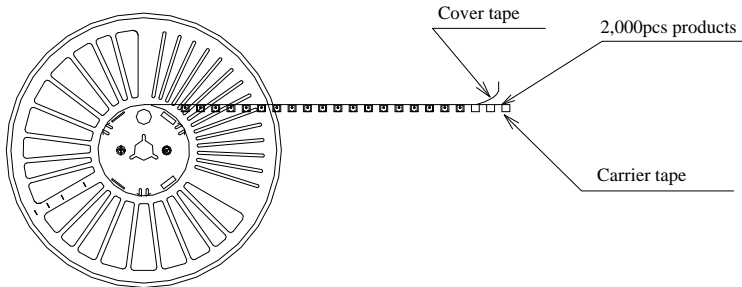
Carrier tape

②Inner packing material： ・Reel(PPE) ・Carrier tape (PC) ・Cover tape(PET)

③Quantity：2,000pcs./Reel

Outer Packaging

   ① Outer Packaging drawing

Taping reel containing products

EIAJ C-3 Label

Silica gel

Humidity indicator

EIAJ C-3 label

Aluminium laminated bag

Aluminium laminated bag containing a taping reel

Cushioning material

Aluminium laminated bag with tape-reel (5 bags)

Packing case

Kraft tape

EIAJ C-3 label

② Outer packing material: Packing case(Corrugated cardboard), Cushioning material (Urethane)

                 Aluminium laminated bag (Alumi-Polyethylene)

                 Humidity indicator card (paper), Label(paper), Silica gel, Craft tape

③ Quantity: 10,000pcs./box

④ 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

⑤ Regular packaged mass: Approximately 700g

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