SHARP

REFERENCE

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OPTO-ANALOG DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

PHOTOINTERRUPTER

MODEL No.

GP1S296HCPSF

Specified for

Enclosed please find copies of the Specifications which consists of 18 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

BY Y. O

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

REFERENCE

Product name : PHOTOINTERRUPTER

Model No. : GP1S296HCPSF

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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) 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. GP1S296HCPSF.

2. Outline : Refer to the attached drawing No. CY13918i02.

3. Ratings and characteristics : Refer to the attached sheet, Page 5, 6, 7.

4. Reliability : Refer to the attached sheet, Page 8.

5. Outgoing inspection : Refer to the attached sheet, Page 9.

6. Supplements

6.1 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 : CFC_S, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methyl chloroform)

6.2 Specified brominated flame retardants

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

6.3 Compliance with each regulation

6.3.1 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)

6.3.2 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 .

6.4 Product mass : Approx. 10mg

6.5 Packing : Refer to the attached drawing No. CY13919i09.

6.6 Taping specification : Refer to the attachment-2.

6.7 Moisture-proof package specification : Refer to the attachment-3.

7. Notes

7.1 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)

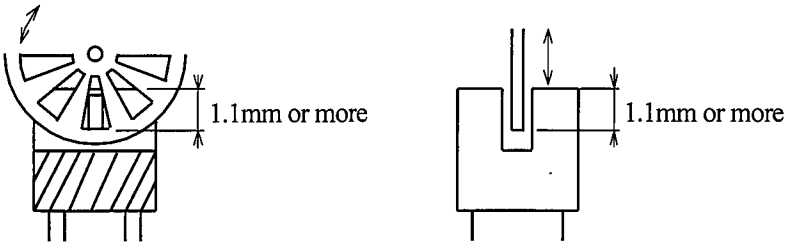
7.2 Prevention of detection error

To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

7.3 Position of opaque board

Opaque board shall be installed at place 1.1mm or more from the top of elements.

(Example)



7.4 Print circuit board design

Because a portion of the internal lead may be exposed at the back of the product, please consider it in the pattern design for a print circuit board design.

7.5 Soldering

(1) Reflow soldering

Please do only one soldering at the temperature and the time within the temperature profile in attachment-1.

(2) Hand soldering

To solder onto lead pins, please solder at 260℃ for 3 seconds or less.

Please also take care not to let mechanical stress exert on package and lead pins when soldering.

Please have soldering adjustment, etc. after GP1S296HCPSF is cooled down, and also note that the outer mold resin may be meltdown by heating for a long time.

Since the tip of the lead has exposed lead frame base material, there is a case not to be soldered, so please consider the soldering pattern on a print circuit board to solder well with the bottom and side surface of the lead.

7.6 Cleaning

Cleaning shall be carried out under the below conditions to avoid keeping solvent, solder and flux on the device.

(1) Solvent cleaning : Solvent temperature 45℃ 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

7.7 Lead pin

Lead terminals of this product have Copper, Nickel, Palladium and Gold plating.

Before usage, please evaluate solder ability with actual conditions and confirm.

The uniformity in color for the lead terminals are not specified.

7.8 Storage and management after open

7.8.1 Storage condition : Storage shall be in accordance with the below conditions.

Storage temp. : 5 to 30℃

Storage humidity : 70%RH or less

7.8.2 Treatment after open

(1) After open, please mount at the conditions of humidity 60%RH or less and temperature 5 to 25℃ within 2 days.

(2) In case of long time storage after open, please storage at the conditions of humidity 70%RH or less and temperature 5 to 30℃ by using dry box or resealing with desiccant in moisture-proof bag by sealer and mount within 2 weeks.

7.8.3 Baking before mounting

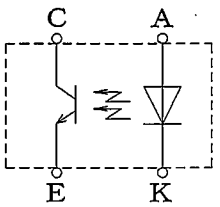
In case that it could not carry out the above treatment, it is able to mount with baking treatment.

However baking treatment shall be limited only 1 time. Although it is possible to have baking treatment with taping package, please bake it by putting a reel with standing situation. Please do not lay it down since it may change the reel shape and occur a mounting problem. Since a label and a fixing tape for the carrier tape does not have enough heat resistance, there may be a case to leave some paste.

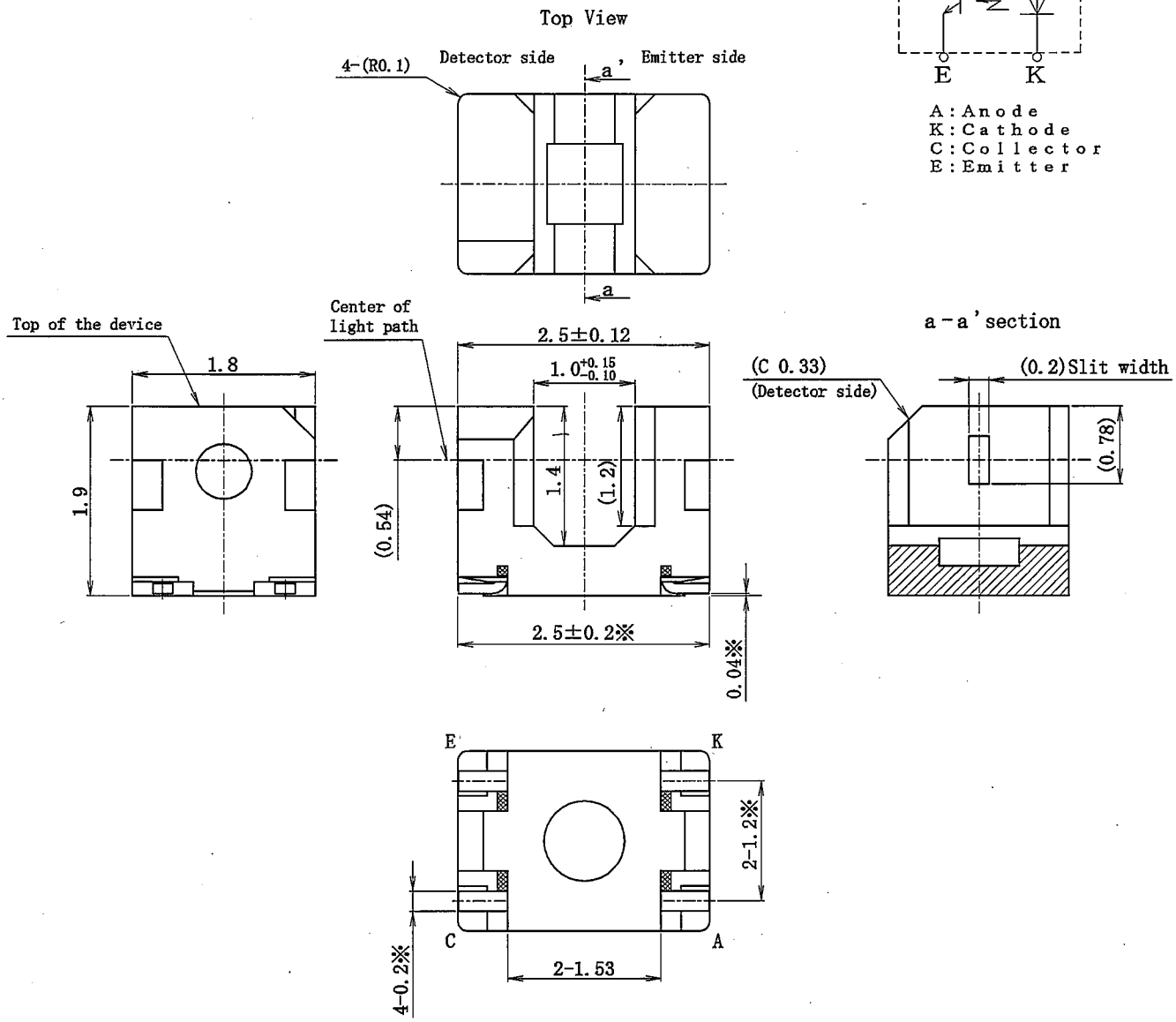
Recommended baking conditions : 100℃, 16 to 24 hours

2. Outline Dimensions (Drawing No. CY13918102) Scale:15/1 Unit:mm

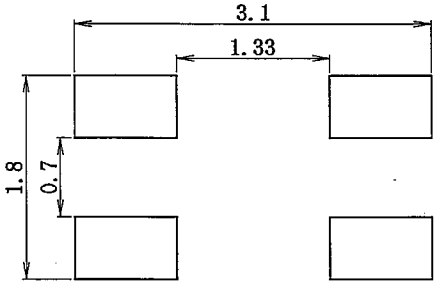
Circuit:Top View



A:Anode
K:Cathode
C:Collector
E:Emitter



<Reference>
Recommended soldering pattern dimensions



Note

1) Unspecified tolerance shall be ±0.1mm.
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 0.15Max.
5) There is a possibility that the lead of ▨ part is exposed.
6) There is a possibility that the internal device is exposed at the top of the device because of the thin thickness of the outer package.
7) The recommendation pattern receives the influence of reflow soldering and solder type etc.. Sufficiently after doing the verification of mounting, please decide.

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25℃

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	30	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P	60	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	Ic	20	mA
	Collector power dissipation	Pc	60	mW
Total power dissipation		Ptot	80	mW
Operating temperature		Topr	-25 to +85	℃
Storage temperature		Tstg	-40 to +100	℃
* Soldering temperature		Tsol	260	℃

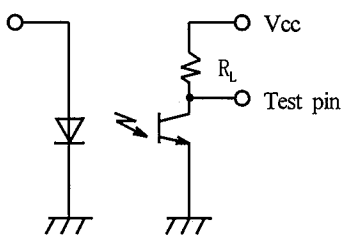
* Soldering time : 3 s or less

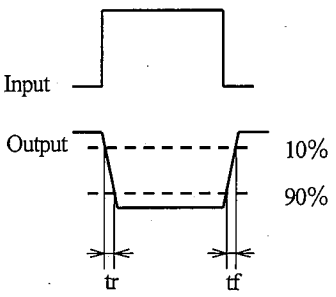
3.2 Electro-optical characteristics

Ta=25℃

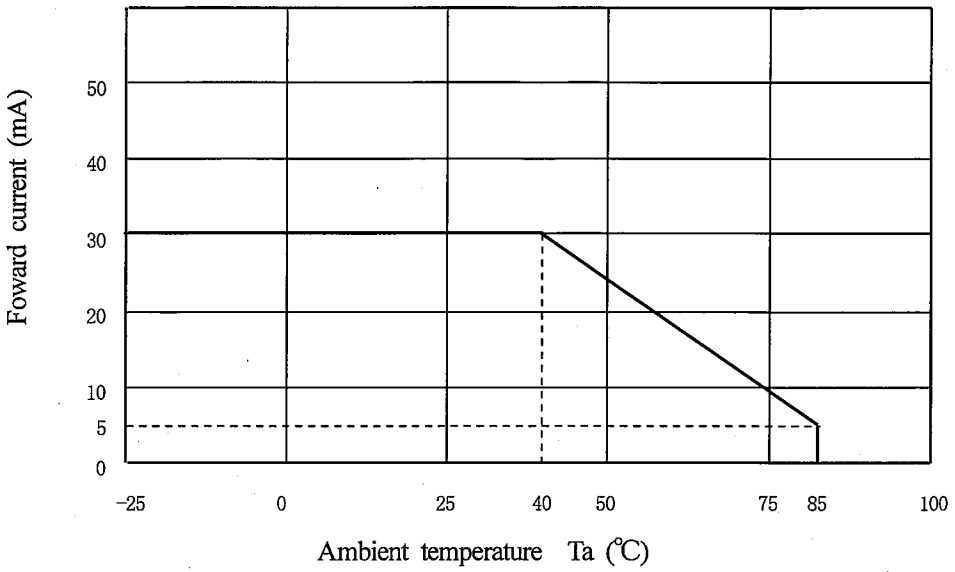
Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=20mA	-	1.2	1.4	V
	Reverse current		I_R	V_R=3V	-	-	10	μA
Output	Collector dark current		I_{CEO}	V_{CE}=20V	-	-	100	nA
Transfer character-is tics	Collector current		Ic	V_{CE}=5V, I_F=5mA	150	-	600	μA
	Response time	(Rise)	tr	V_{CE}=5V, Ic=100 μA	-	50	150	μs
		(Fall)	tf	R_L=1kΩ	-	50	150	μs
	Collector-emitter saturation voltage		V_{CE}(sat)	I_F=10mA, Ic=40 μA	-	-	0.4	V

(Test circuit for response time)

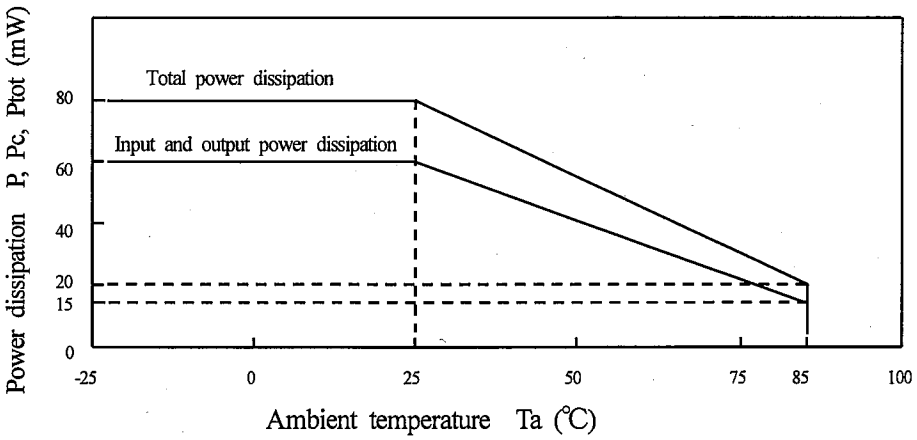




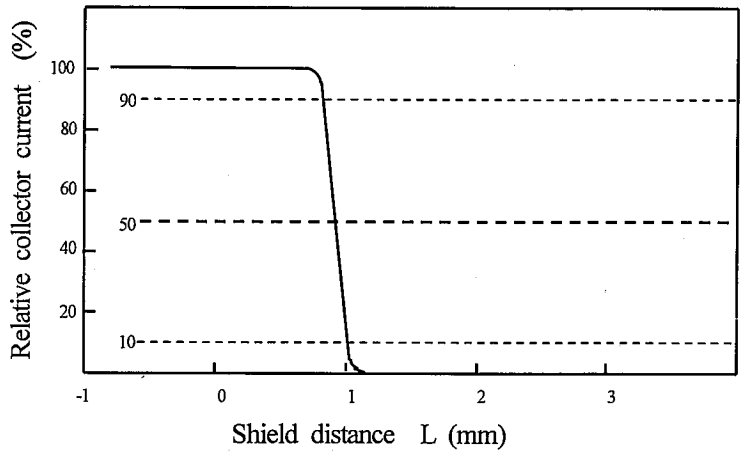
Foward current vs. ambient temperature

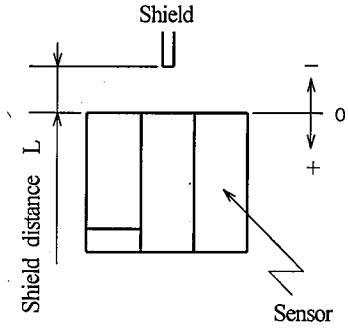


Power dissipation vs. ambient temperature



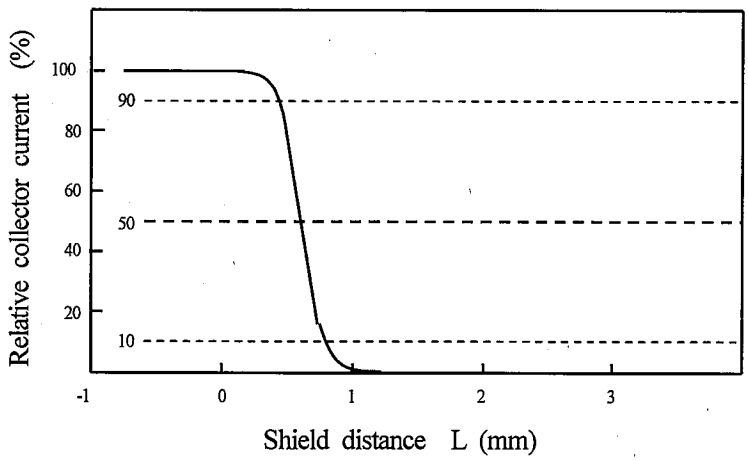
Relative collector current vs. shield distance 1 (Reference value)

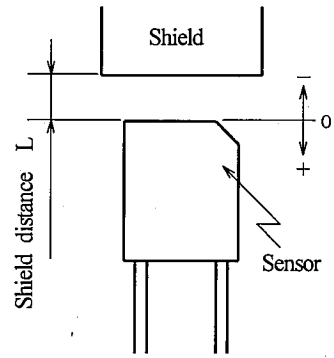




Test condition
I_F=5.0mA
V_{CE}=5V
Ta=25℃

Relative collector current vs. shield distance 2 (Reference value)





Test condition
I_F=5.0mA
V_{CE}=5V
Ta=25℃

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℃ to +100℃ (30min) (30min) 20 cycles test	$I_R \geqq U \times 2$	n=22, c=0
humidity storage	+60℃, 90%RH, 500h	$I_{CEO} \geqq U \times 2$	n=22, c=0
High temp. storage	+100℃, 500h		n=22, c=0
Low temp. storage	-40℃, 500h	$V_F \geqq U \times 1.2$	n=22, c=0
Operation life	I_F=20mA, Ta=25℃, 500h		n=22, c=0
Mechanical shock	15000m/s^2, 0.5ms 3 times/±X, ±Y, ±Z direction	$Ic \leqq L \times 0.8$	n=11, c=0
Variable frequency vibration	100 to 2000 to 100Hz/20min 2h/X, Y, Z direction 100m/s^2	U: Upper specification limit L: Lower specification limit	n=11, c=0
Reflow soldering *	Reflow soldering condition : Attachment-1 Time of reflow soldering : 1 time	$Ic < L \times 0.8$	n=22, c=0

* : 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(TAMURA KAKEN CORPORATION).

5. Outgoing inspection

5.1 Inspection items

(1) Electrical characteristics

V_F, I_R, BV_{ECO}, BV_{CEO}, Ic, I_{CEO}, $V_{CE(sat)}$

(2) Appearance

5.2 Sampling method and Inspection level

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	Characteristics defect	0.065
Minor defect	Defects on appearance *	0.25

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

6. Supplements

6.1 Parts

This product uses the below parts.

6.1.1 Light detector (Quantity : 1)

Type	Material	Maximum sensitivity (nm)	Sensitivity (nm)	Response time (μs)
Phototransistor	Silicon (Si)	930	700 to 1200	20

6.1.2 Light emitter (Quantity : 1)

Type	Material	Maximum light emitting wavelength (nm)	I/O Frequency (MHz)
Infrared light emitting diode (non-coherent)	GaAs	940	0.3

6.1.3 Material

Case	Lead frame	Lead frame plating
Black PPS resin (UL 94V-0)	42 Alloy	Au-Pd-Ni-Cu

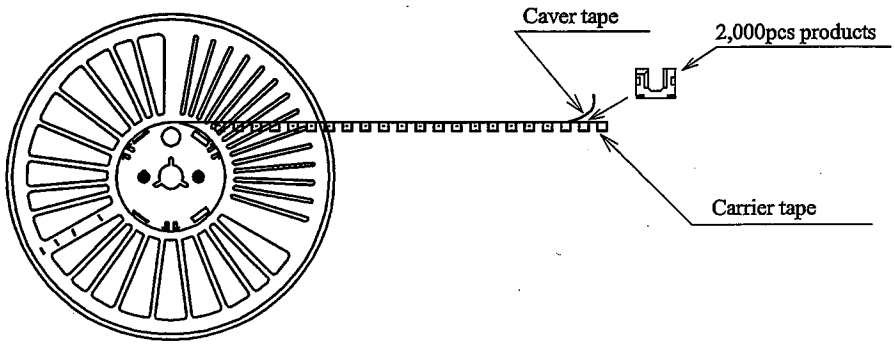
6.1.4 Others

This product shall not be proof against radiation flux.

6.5 Packing (Drawing No.CY13919i09)

6.5.1 Inner Packing

① Inner Packaging drawing

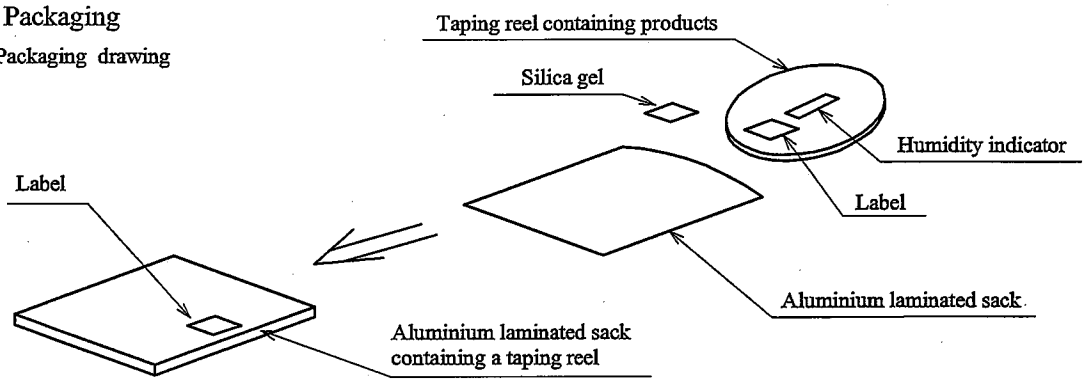


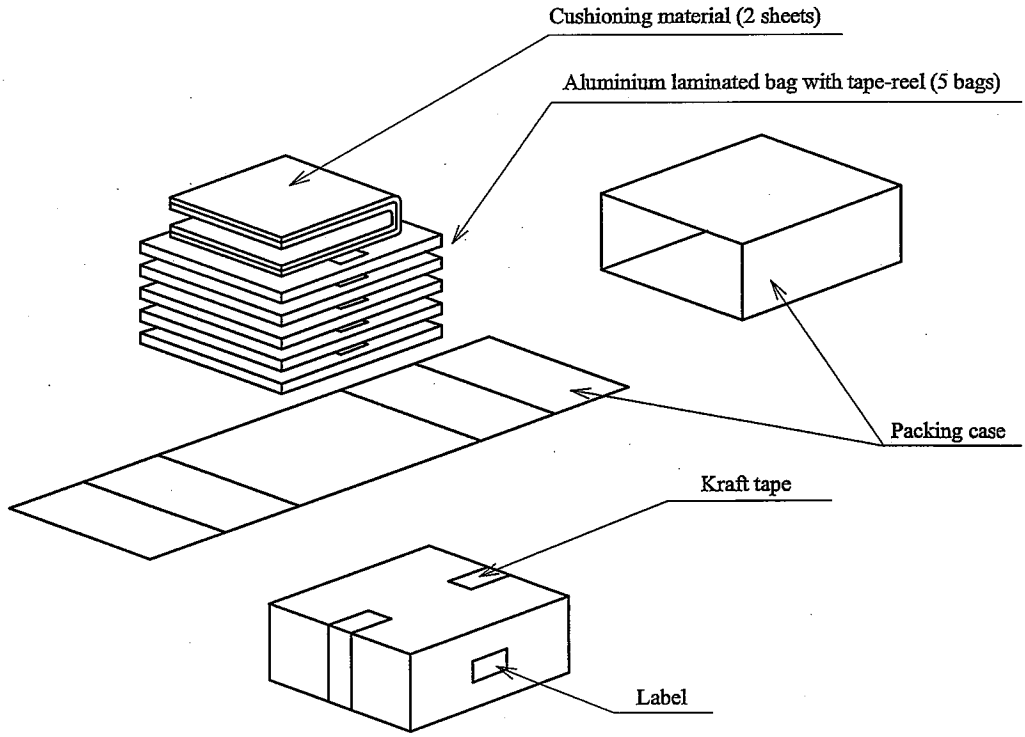
②Inner packing material：・Reel(PPE) ・Carrier tape (PC) ・Caver tape(PET)

③Quantity ：2,000pcs./Reel

6.5.2 Outer Packaging

① Outer Packaging drawing





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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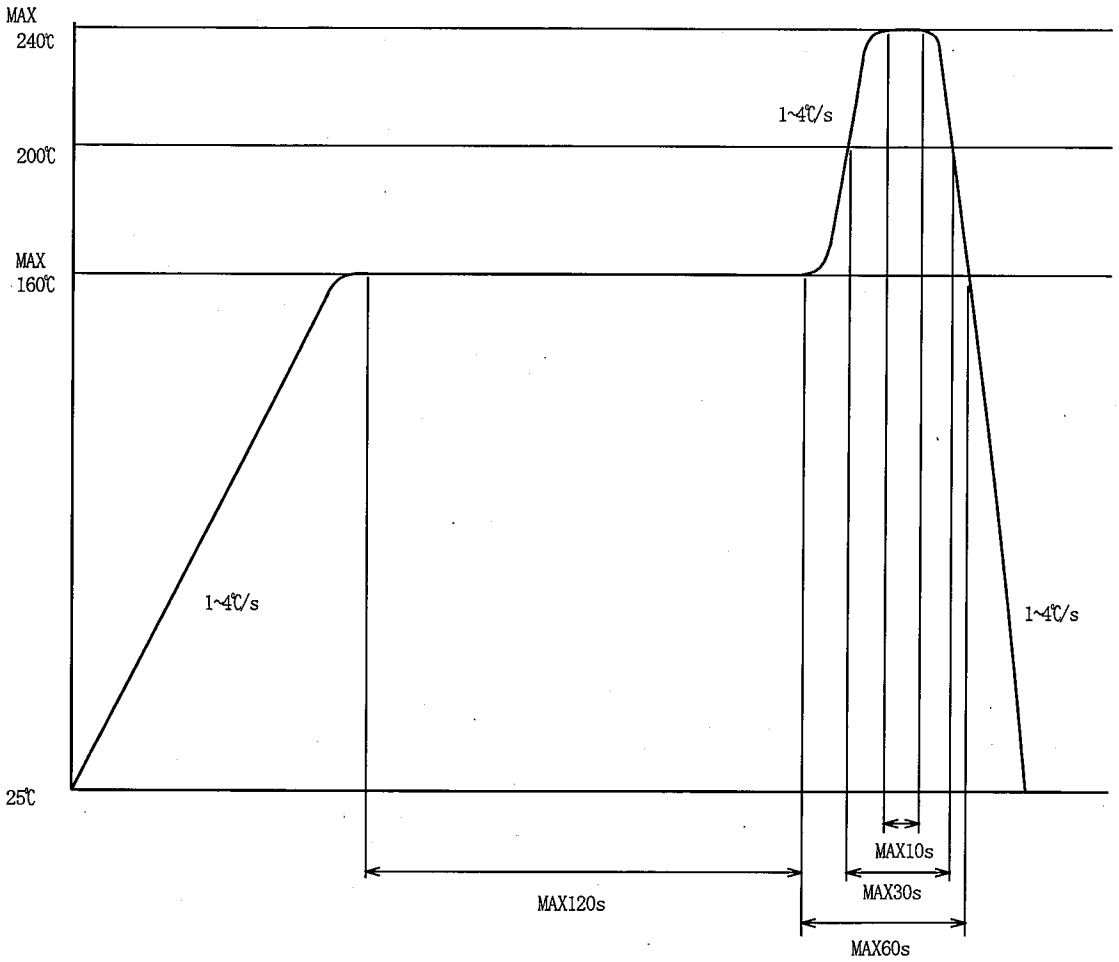
(Attachment-1)

Precautions for Soldering photointerrupter

1. In case of reflow soldering,
   Please do only one soldering at the temperature and the time within the temperature profile as shown in the figure below.



2. Other precautions
   An infrared lamp used to heat up for soldering may cause a localized temperature rise in the resin.
   So keep the package temperature within that specified in Item 1.
   Also avoid immersing the resin part in the solder.
   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 by actual solder reflow machine.

(Attachment-2-1)

Package specifications (φ180mm reel)

1. Application

This specification applies to the taping specifications and the relation items for the GP1S296HCPSF.

2. Taping method

2.1 Tape structure and Dimensions (Refer to the attached sheets-2-2)

2.1.1 The tape shall have a structure in which a cover tape is sealed pressed on the carrier tape made by polystyrene to protect against static electricity.

2.2 Reel structure and Dimensions (Refer to the attached sheets-2-3)

2.3 Direction of product insertion (Refer to the attached sheets-2-3)

2.3.1 Product direction in carrier tape shall direct to the detector at the hole side on the tape.

3. Repair method of sealing error

3.1 In case of repairing a sealing error, three sides of a cover tape matching to the product insertion portion are opened by a cutter and it will be closed by adhesiveness tape after repairing.

4. Adhesiveness of cover tape

4.1 The exhalation force between carrier tape and cover tape shall be 0.2N to 1.0N for the angle from 160°to 180°.

5. Rolling method and quantity

5.1 Wind the tape back on the reel so that the cover tape will be outside the tape.

5.2 Attach more than 20cm of blank tape to the trailer and attach more than 28cm of the leader to the tape and fix the both ends with adhesive tape.

5.3 One reel shall contain 2,000 pcs.

6. Indication items

The contents of the carton indication conforms to EIAJ C-3 and the following items are indicated.

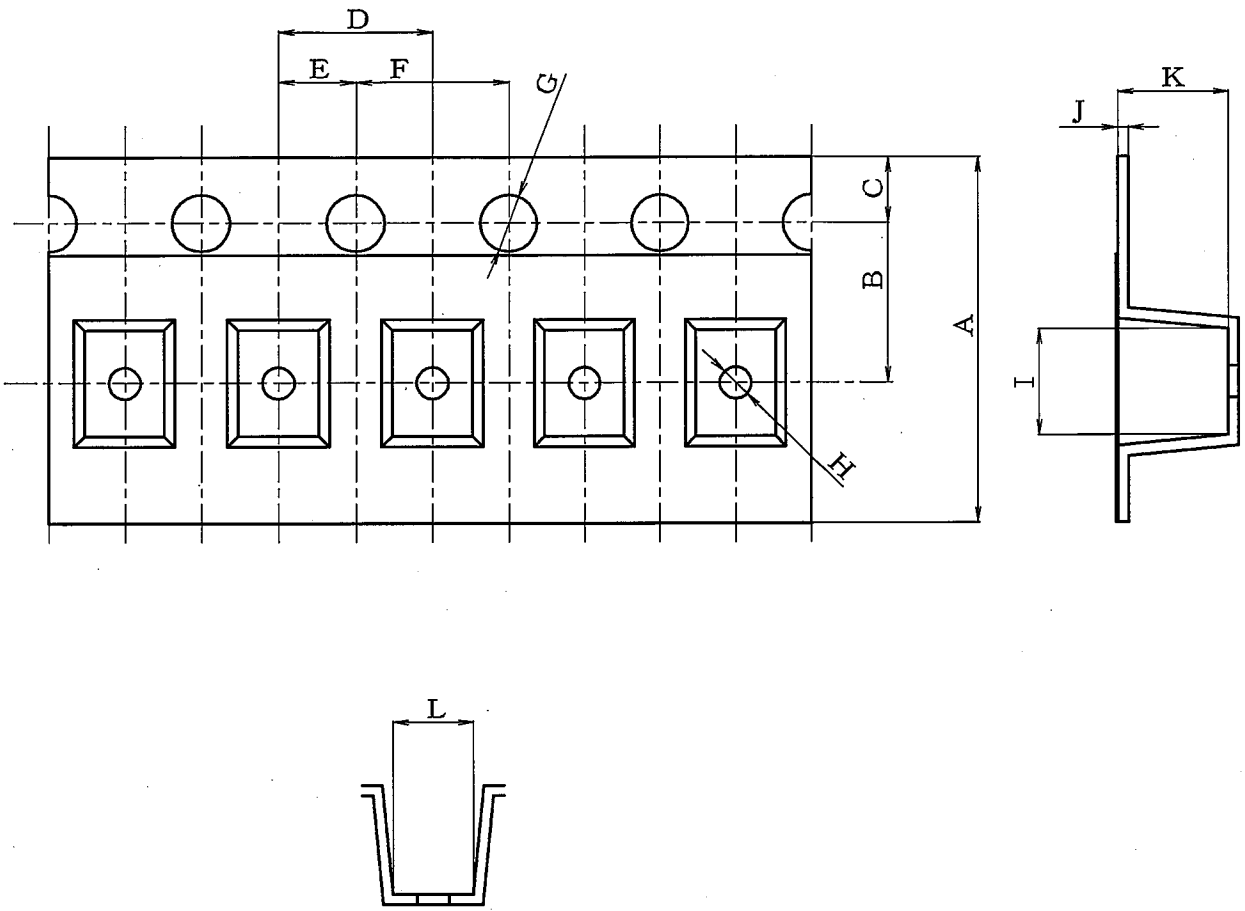
Model No., Internal production control name, Quantity, Packing date, Corporate name, Country of origin

7. Safety protection during shipping

There shall be no deformation of component or degradation of electrical characteristics due to shipping.

(Attachment-2-2)

2.1 Tape structure and dimensions



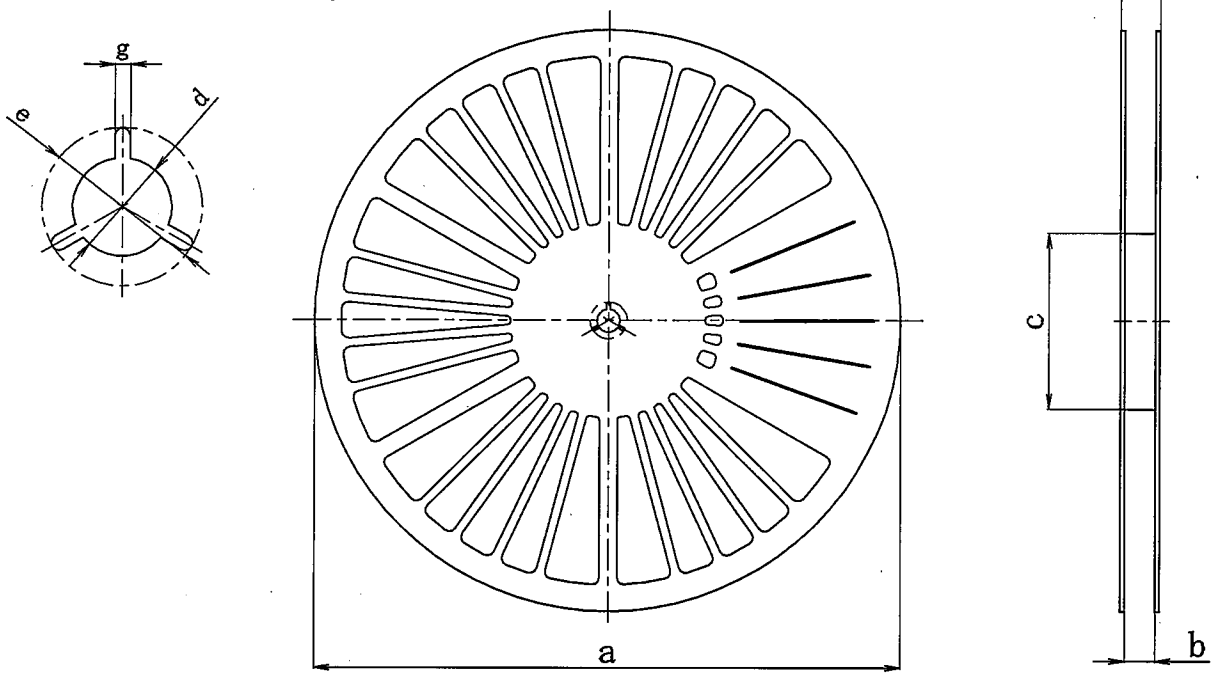
Symbol / Unit	Dimensions					
	A	B	C	D	E	F
mm	8.0 ±0.3	3.5 ±0.1	1.75 ±0.1	4.0 ±0.1	2.0 ±0.1	4.0 ±0.1

Symbol / Unit	Dimensions					
	G	H	I	J	K	L
mm	φ1.5 +0.1 −0	φ1.0 ±0.2	2.75 ±0.1	0.30 ±0.05	2.1 ±0.1	2.0 ±0.1

(Attachment-2-3)

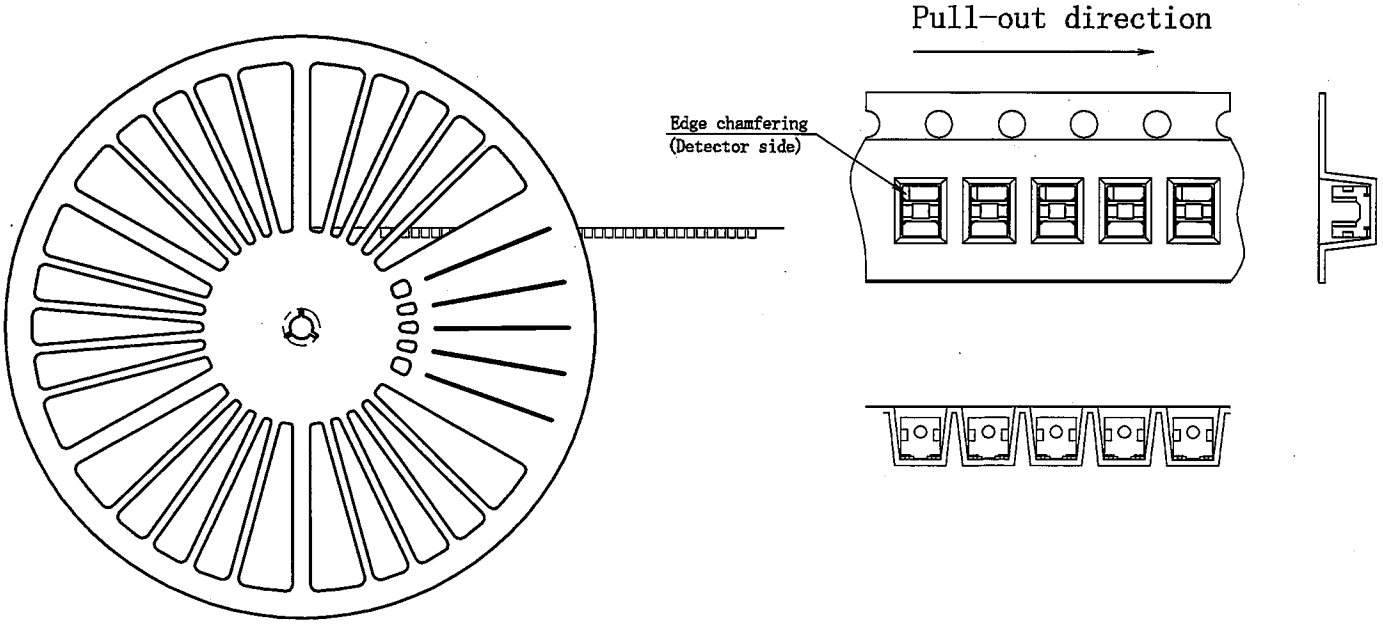
2.2 Reel structure and dimensions

Details for reel fixing hole



Symbol / Unit	Dimensions						
	a	b	c	d	e	f	g
mm	ϕ180±2.0	9.5±1.0	ϕ60±1.0	ϕ13±0.2	21±0.8	13.1±1.0	2±0.5

2.3 Direction of product insertion



(Attachment-3-1)

REFERENCE

Moisture-proof package specification

1. Application

This specification applies to the moisture-proof package for the GP1S296HCPSF.

2. Packaging specifications

2.1 Packaging material

Name	Material
Aluminum laminated sack	Aluminum polyethylene
Label	Paper(-made)
Silica gel	-
Outer case	Paper(-made)
Cushioning material	Urethane
Indicator	Paper(-made)

2.2 Packaging method

2.2.1 Seal a reel with 2,000pcs products into an aluminum laminated bag included the ruled silica gel quantity.

2.2.2 Fill up the blank of label and paste on the bag.

2.2.3 Put the moisture-proof laminated bag in the ruled case (5bag/case).

Cushioning material is attached at both top and bottom of every bag.

Package shape	Product	Quantity	Moisture-proof sack Quantity
Tape-reel (ϕ 180mm)	Single	2,000pcs./reel	1reel/bag

Minimum order Quantity : 2,000pcs (1 reel/bag)

2.2.4 Fill out the model name, quantity and date after closing the outer case by craft tape.

(Quantity: 10,000pcs./case) *Except the case products by failing to seal are cut out

3. Storage and management after open

3.1 Storage condition : Storage shall be in accordance with the below conditions.

Storage temp. : 5 to 30℃

Storage humidity : 70%RH or less

3.2 Treatment after open

(1) After open, please mount at the conditions of humidity 60%RH or less and temperature 5 to 25℃ within 2 days.

(2) In case of long time storage after open, please storage at the conditions of humidity 70%RH or less and temperature 5 to 30℃ by using dry box or resealing with desiccant in moisture-proof bag by sealer and mount within 2 weeks.

3.3 Baking before mounting

In case that it could not carry out the above treatment, it is able to mount with baking treatment. However baking treatment shall be limited only 1 time. Although it is possible to have baking treatment with taping package, please bake it by putting a reel with standing situation. Please do not lay it down since it may change the reel shape and occur a mounting problem. Since a label and a fixing tape for the carrier tape does not have enough heat resistance, there may be a case to leave some paste.

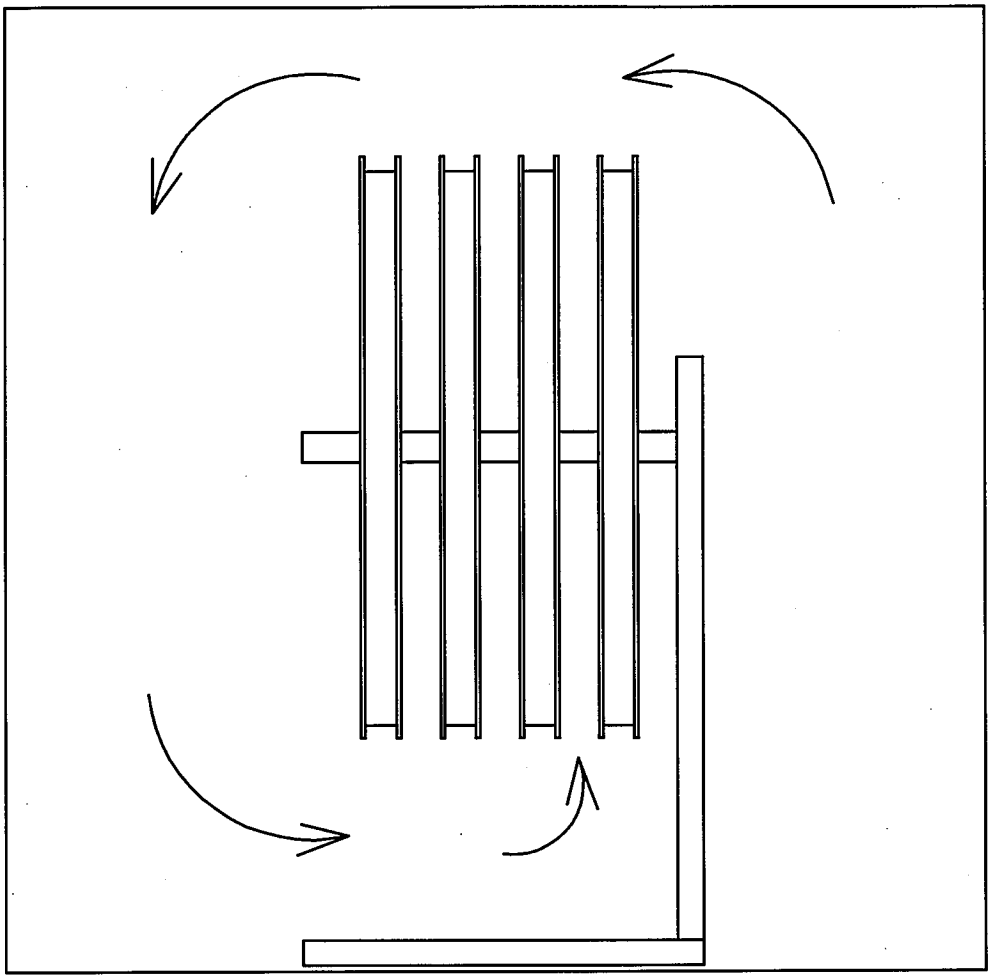
Recommended baking conditions : 100℃, 16 to 24 hours

REFERENCE

(Attachment-3-2)

3. 3 Baking treatment before mounting

3. 3. 1 Placement of reels in an oven



1) Please hang reels by using a center hole for fixing the reel.
   Please keep some space between reels for better air rotation in the oven.
   Please do not lay a reel down in the oven to avoid any damages for the tape edge and the flange of reel.
2) Please make sure the carrier tape does not have any slack in a reel before baking to avoid peeling the cover tale off.
   Since the tape using for fixing carrier tape is not heatproof,
   there is a case to remain glue.
   So if necessary, please change the tape to a heatproof one.