SPEC No. ED-05G041
ISSUE March 22, 2005

SHARP

OPTO-ELECTRONIC DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

OPIC LIGHT DETECTOR

MODEL No.

IS471FE

Specified for

Enclosed please find copies of the Specifications which consists of 12 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 H. O

H. Ogura,
Department General Manager of
Engineering Dept.,III
Opto-Electronic Devices Div.
ELECOM Group
SHARP CORPORATION

REFERENCE

Product name : OPIC LIGHT DETECTOR

Model No. : IS471FE

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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 (etc.))

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 OPIC light detecting device; Model No. IS471FE.

2. Outline
   Refer to the attached drawing No. : CY12969L02, page 3.

3. Ratings and characteristics
   Refer to the attached sheet, page 4 to 7.

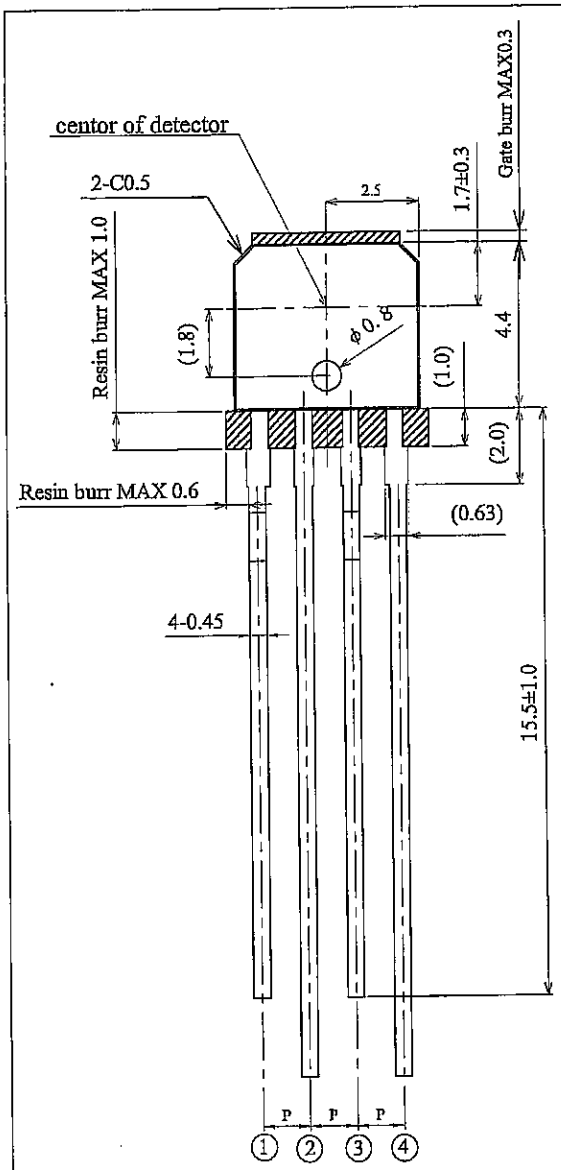
4. Reliability
   Refer to the attached sheet, page 8.

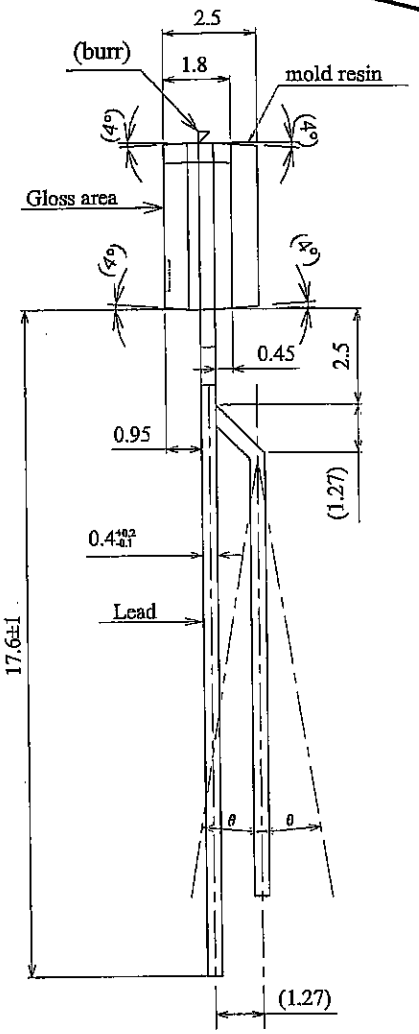
5. Outgoing inspection
   Refer to the attached sheet, page 9.

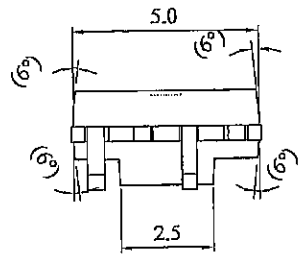
6. Supplement
   (6-1) Equivalent circuit and Operating refer to the attached sheet, page 10.
   (6-2) Packing refer to the attached sheet, page 11.
   (6-3) This product is not designed against electromagnetic and ionized-particle irradiation.
   (6-4) This product shall not contain the following materials.
   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)
   (6-5) This product and packaging material shall not contain lead material.
   (6-6) Product mass (Piece) : Approximately 0.18g

7. Notes
   (7-1) By-pass capacitor
   To avoid the malfunction by the power line noise, please place the capacitor above 0.33μF (f=1MHz) between Vcc-GND (①-③terminals).
   (7-2) Cleaning conditions :
   Solvent cleaning : Solvent temperature 45℃ or less Immersion for 3 min or less
   Ultrasonic cleaning : The effect to device by ultrasonic cleaning differs by cleaning bath size, ultrasonic power output, cleaning time, PCB size or device mounting condition etc.
   Please test it in actual using condition and confirm that doesn't occur any defect before starting the ultrasonic cleaning.
   The cleaning shall be carried out with solvent below.
   Solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol
   (7-3) Soldering
   The lead pins should be soldered according to the absolute maximum ratings.
   While or after soldering, the lead pins shall be free from external force.
   This device shall not be soldered with preheat or reflow.
   The terminal covering of this device consists of lead free solder.
   In case of lead free soldering, please make sure that there is no problem in practical use since there is a possibility of boundary exfoliation (Lift-off phenomenon) between the solder and the land.

REFERENCE







1) Unspecified tolerance shall be ±0.2.
2) Dimensions in parenthesis are shown for reference.
3) The deflection angle (θ) of lead terminals are ±15°MAX.
4) ▨ shows burr.
5) The mold surface other than gloss area is satin finish.
6) Package : Black (Visible light cut-off resin)
7) The lead pitch(P) is 1.27. (at lead base)

Pin name

① Vcc	③ GND
② Vo	④ GLout

Scale	Material	Finish	Name	IS471FE Outline Dimensions
5/1	Lead : Fe	Lead pin : Solder dip		
Unit	Package : Epoxy resin	Lead-free solder use Composition (Standard value) Sn96.5%,Ag3.0%,Cu0.5%	Drawing No.	CY1296 9L02
1 = 1/1 mm				

3. Ratings and characteristics

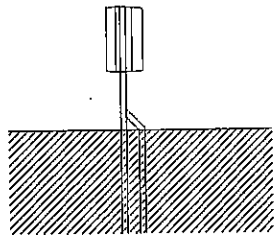
3-1 Absolute maximum ratings

Ta=25℃

Parameter		Symbol	Rating	Unit
Supply voltage		Vcc	-0.5~16	V
output	Output voltage	Vo	16	V
	Output current	Io	50	mA
LED output	Output voltage	V_{GL}	16	V
*1 Power dissipation		P	250	mW
Operating temperature		Topr	-25 ~ +60	℃
Storage temperature		Tstg	-40 ~ +100	℃
*2 Soldering temperature		Tsol	260	℃

*1. Power dissipation vs. ambient temperature is as per fig 5.

*2. Max 5sec at the position shown below.



Solderable

Immersed to the bent angle

3-2 Electro-optical characteristics (Vcc=5V, Ta=25°C)

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Supply voltage		V_{CC}	4.5	-	16	V	
Supply current		I_{CC}	-	3.5	7.0	mA	Vo, GL_O terminals are open.
Output	Low level output voltage	V_{OL}	-	0.15	0.35	V	I_{OL}=16mA, E_{VP}=500 lx E_{VD}=0 lx
Output	High level output voltage	V_{OH}	4.97	-	-	V	E_{VP} =E_{VD}=0 lx No.1
Output	Output short circuit current	I_{OS}	0.25	0.5	1.0	mA	E_{VP} =E_{VD}=0 lx No.1
LED Output	Low level output current	I_{GL}	40	55	70	mA	V_{GL}=1.2V
LED Output	*1 Pulse frequency	t_P	70	130	220	μs	
LED Output	*1 Pulse width	t_W	4.4	8	13.7	μs	
*2 " L→H " threshold radiation illuminance		E_{ePLH}	-	0.4	2.66	$\mu W/mm^2$	E_{eD}=0$\mu W/mm^2$ No.1,2 LED(λ_P=940nm)
*2 " H→L " threshold radiation illuminance		E_{ePHL}	-	0.7	2.8	$\mu W/mm^2$	E_{eD}=0$\mu W/mm^2$ No.1,2 LED(λ_P=940nm)
Hysteresis		E_{ePLH} / E_{ePHL}	0.45	0.65	0.95	-	
Response time	"H→L" propagation time	t_{PHL}	-	400	670	μs	No.2
Response time	"L→H" propagation time	t_{PLH}	-	400	670	μs	No.2
*3 Permissible disturbance illuminance		E_{VDX}	2000	7500	-	lx	E_{eP}=7.5$\mu W/mm^2$, λ_P=940nm

*1 The definition of Pulse frequency(t_P) and Pulse width (t_W) are shown in fig. 1.
The wave form of fig. 1 shows the output voltage wave of GL_O terminal of the diagram of fig 2.

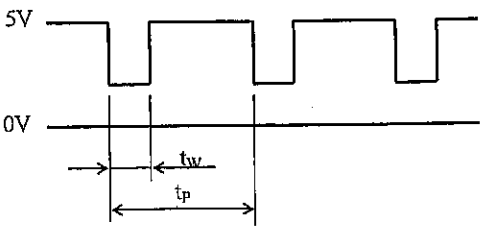


Fig.1

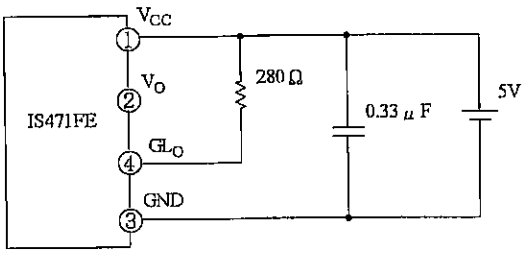


fig.2

*2 "L→H" ("H→L") threshhold radiation illuminance
It shows E_{eP} when output changes to L→H (H→L).

*3 E_{VDX}: Limit of E_{VD} that this device works normally.

E_{VP} shows the illuminance of signal light syncronized with the low level timing of GL_O terminal output.
E_{VD} shows the iluminance of direct current light. The light source is according to CIE standard.

Measurement conditions

No.1 E_{eP}, E_{eD}

E_{eP} shows the illuminance of signal light syncronized with the low level timing of GL_O terminal output.
E_{eD} shows the illuminance of direct current light. Fig 3 shows the details.
The light source is LED (λ_P=940nm)

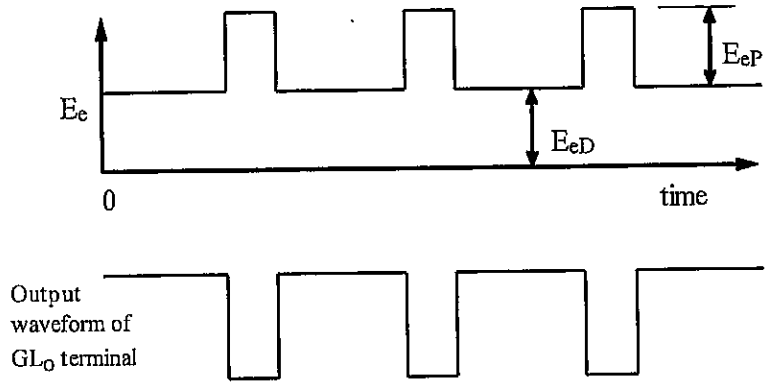


Fig.3

(Note) It shows the GL_O terminal's waveform at fig 2 diagram.

No.2 Response time, Threshhold radiation illimance

Fig 4 shows the measuring circuit of response time, threshhold radiation illuminance.

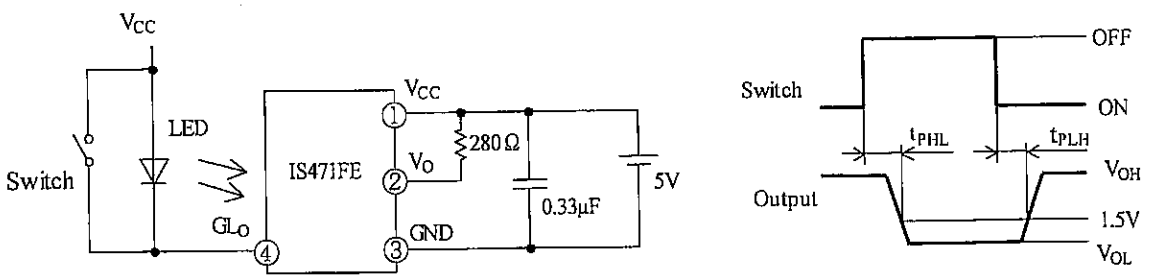
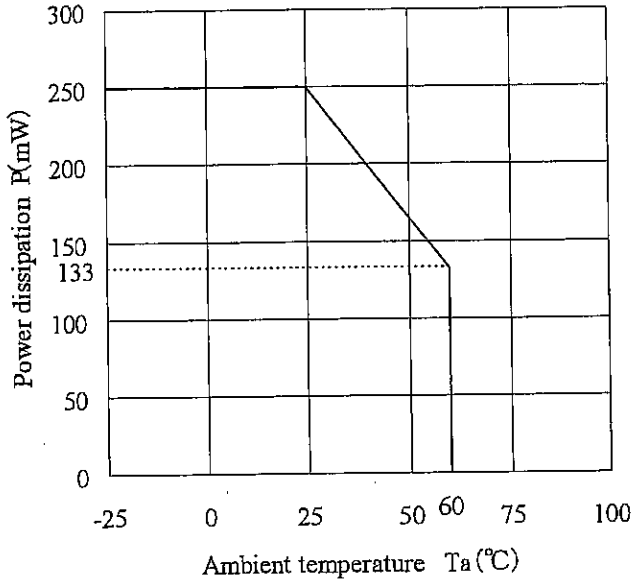


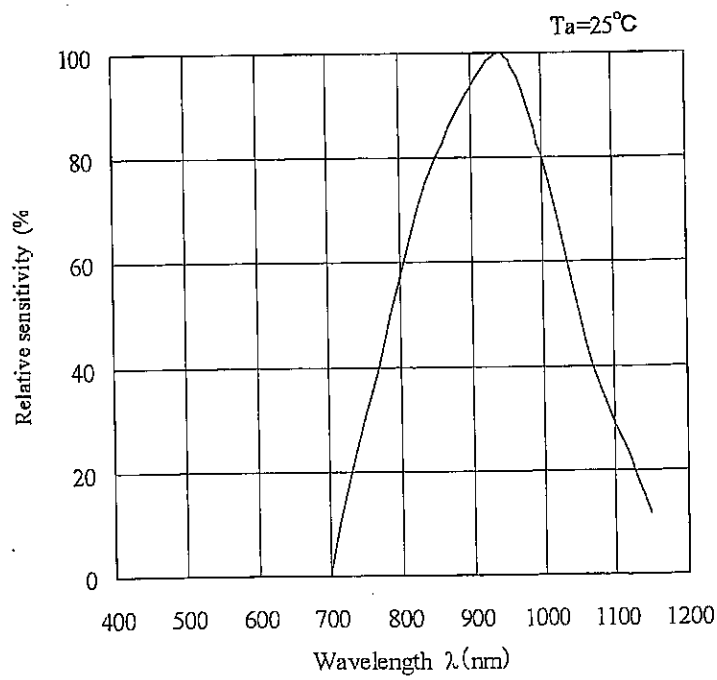
Fig.4

LED: peak emission wavelength λ_P=940nm.

(Fig.5) Power dissipation vs. ambient temperature



(Fig.6) Spectral sensitivity (TYP)

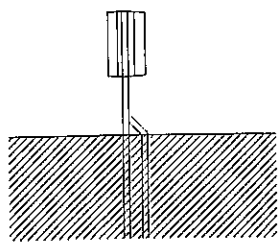


4. Reliability

The reliability of products shall satisfy items listed below.

Confidence level : 90%
LTPD : 10 or 20

Test Items	Test Conditions	Failure Judgement Criteria	Samples (n) / Defective(C)
Temperature cycling	1 cycle -40℃←→+100℃ (20min) (20min) 20 cycles test	More than U×1.2 Less than L×0.8 U: Upper specification limit L: Lower specification limit	n=22, C=0
High temp. and high humidity storage	+60℃,90%RH, 1000h		n=22, C=0
High temp. storage	+100℃, 1000h		n=22, C=0
Low temp. storage	-40℃, 1000h		n=22, C=0
Operation test	V_{CC}=5V, Ta=25℃, 1000h		n=22, C=0
Mechanical shock	1000m/s^2, 6ms, Half sine wave 3 times/±X, ±Y, ±Z direction		n=11, C=0
Variable frequency vibration	100 to 2000 to 100Hz/Sweep for approx. 4min 200m/s^2, 48min/X, Y, Z direction		n=11, C=0
Electrostatic withstand voltage	±200V, 200pF Once each terminal (V_{CC},GND reference)		n=11, C=0
Soldering heat	260±5℃ , 5±0.5 s Immersed to the bent angle		n=11, C=0
Solderability	245±5℃, 5±1 s Immersed to the bent angle Flux:EC-19S (Tamura kaken corporation) No pretreatment	Solder shall adhere at less than 95% area of dipped portion.	n=11, C=0



Solderable

Immersed to the bent angle

5. Outgoing inspection

(1) Inspection parameter

a. Electro-optical characteristics

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Supply voltage		V_{CC}	4.5	-	16	V	
Supply current		I_{CC}	-	3.5	7.0	mA	Vo, GL_O terminals are open.
Output	Low level output voltage	V_{OL}	-	0.15	0.35	V	I_{OL}=16mA, E_{VP}=500 lx E_{VD}=0 lx
Output	High level output voltage	V_{OH}	4.97	-	-	V	E_{VP} =E_{VD}=0 lx No.1
Output	Output short circuit current	I_{OS}	0.25	0.5	1.0	mA	E_{VP} =E_{VD}=0 lx No.1
LED Output	Low level output current	I_{GL}	40	55	70	mA	V_{GL}=1.2V
LED Output	*1 Pulse frequency	t_P	70	130	220	μs	
LED Output	*1 Pulse width	t_W	4.4	8	13.7	μs	
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*2 " H→L " threshold radiation illuminance		E_{ePHL}	-	0.7	2.8	μW/mm^2	E_{eD}=0μW/mm^2 No.1,2 LED(λ_P=940nm)
Hysteresis		E_{ePLH} / E_{ePHL}	0.45	0.65	0.95	-	
Response time	"H→L" propagation time	t_{PHL}	-	400	670	μs	No.2
Response time	"L→H" propagation time	t_{PLH}	-	400	670	μs	No.2
*3 Permissible disturbance illuminance		E_{VDX}	2000	7500	-	lx	E_{eP}=7.5μW/mm^2, λ_P=940nm

b.Appearance

Defects	Judgement criteria
Cracks of product (resin area)	The cracks above 1mm size, and cracks over the lead frame are defects.

* The appearance should not affect the electrical, optical characteristics.

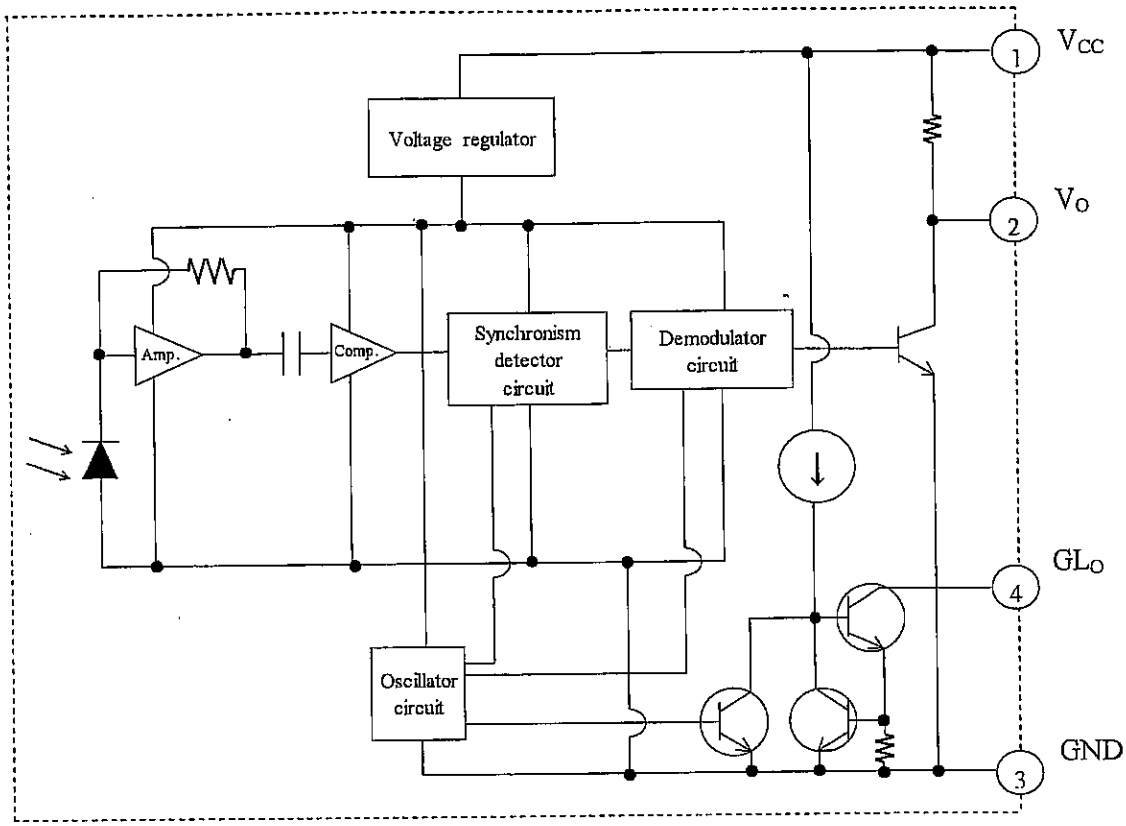
(2) Sampling method and inspection criteria

ISO 2859 one time sampling

Defects	Judgement criteria	AQL(%)
Major defects (Electro-optical characteristics defects, Assembly defects)	Normal inspection level Ⅱ	0.1
Minor defects (Appearance defects)	Normal inspection level Ⅱ	0.25

6-1 Equivalent circuit and Operating

(6-1-1) Equivalent circuit



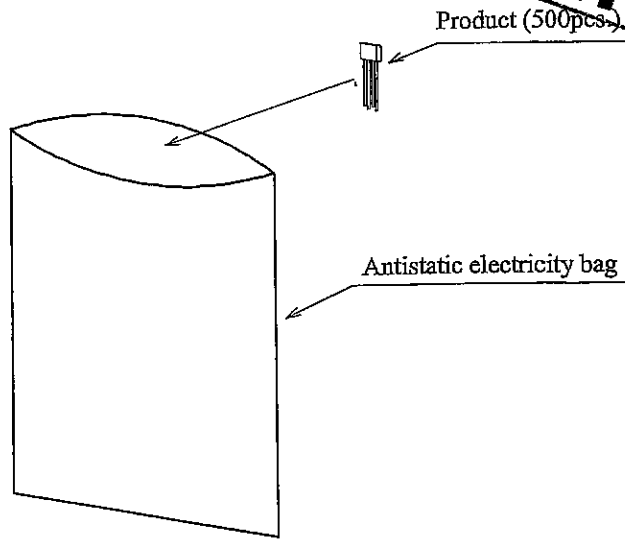
(6-1-2) Operating (True value)

Input	Output
Light ON	Low level
Light OFF	High level

6-2 Packaging

6-2-1 Inner packing

① Inner packing drawing

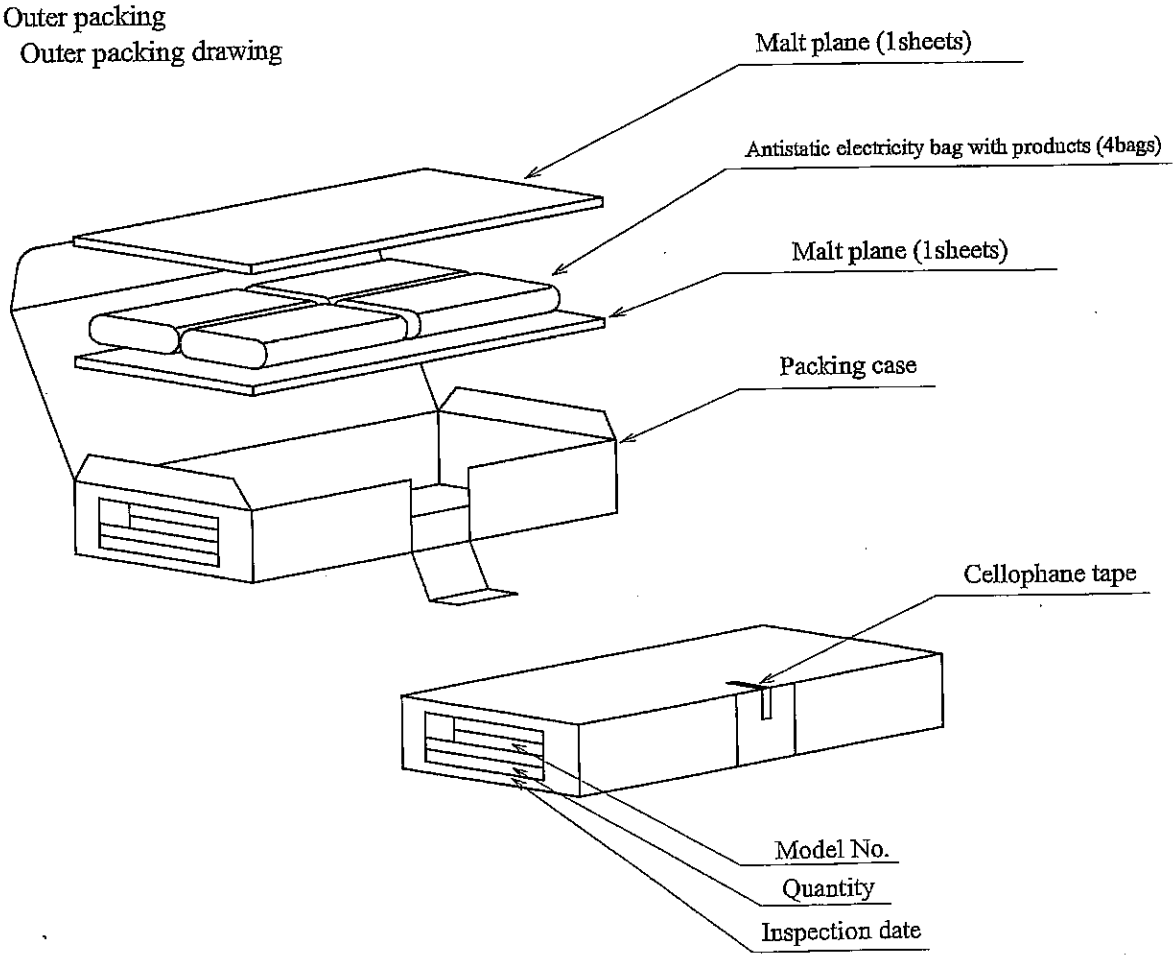


② Inner packing material : Antistatic electricity bag (Polyethylene)

③ Quantity : 500pcs./bag

6-2-2 Outer packing

① Outer packing drawing



② Outer material : Packing case (Corrugated cardboard),
Malt plane (Urethane), Cellophane tape

③ Quantity : 2000pcs./box

④ Indication : Model No., quantity and inspection date

⑤ Regular packaged mass : Approximately 430g