

# SHARP

OPTO-ANALOG DEVICES DIVISION  
ELECTRONIC COMPONENTS GROUP  
SHARP CORPORATION

## SPECIFICATION

DEVICE SPECIFICATION FOR

MODEL No. PHOTOINTERRUPTER  
GP3A233RBK0F

Specified for Lexmark International, Inc.

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 Dec. 28, 2007

BY

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

Product name : PHOTOINTERRUPTER

Model No. : GP3A233RBK0F

1. These specification sheets include materials protected under copyright of Sharp Corporation ("Sharp"). Please do not reproduce or cause anyone to reproduce them without Sharp's consent.
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,with PCB, Model No. GP3A233RBK0F.

2. Outline

2.1 GP3A233RBK0F

Refer to the attached drawing No. CY13784i02, Page 4.

2.2 GP1A047RBZLF

Refer to the attached drawing No. CY13785i02, Page 5.

3. Ratings and characteristics

- Refer to the attached sheet, Page 6 to 9.
- Connection diagram : Refer to the attached drawing No.CY13788i08, Page 9.
- Resolution : 150LPI (169 μ m)
- Output waveform : Digital 2-phase (Phase A and Phase B)

4. Reliability

Refer to the attached sheet, Page 10.

5. Outgoing inspection

Refer to the attached sheet, Page 10.

6. Supplements

6.1 Parts

Refer to the attached sheet, Page 11.

6.2 Packing

Refer to the attached drawing No. CY13789i09, Page 12.

6.3 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 : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methyl chloroform)

6.4 Specified brominated flame retardants

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

6-5 Compliance with each regulation

6-5-1 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 \*1 and glass of electronic components), cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

\*1 : i.e. tin-lead solder alloys containing more than 85% lead

6-5-2 Content of six substances specified in Management Method 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)
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.

\* : 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 high melting temperature type solders (i.e. tin-lead solder alloys containing more than 85% lead) and 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.

- 6-6 Product mass : Approximately 2.6g
- 6-7 Country of origin : Japan, China, Indonesia

7. Notes

7.1 Cleaning

Please don't carry out immersion cleaning or ultrasonic cleaning to avoid keeping solvent inside case of this devise.

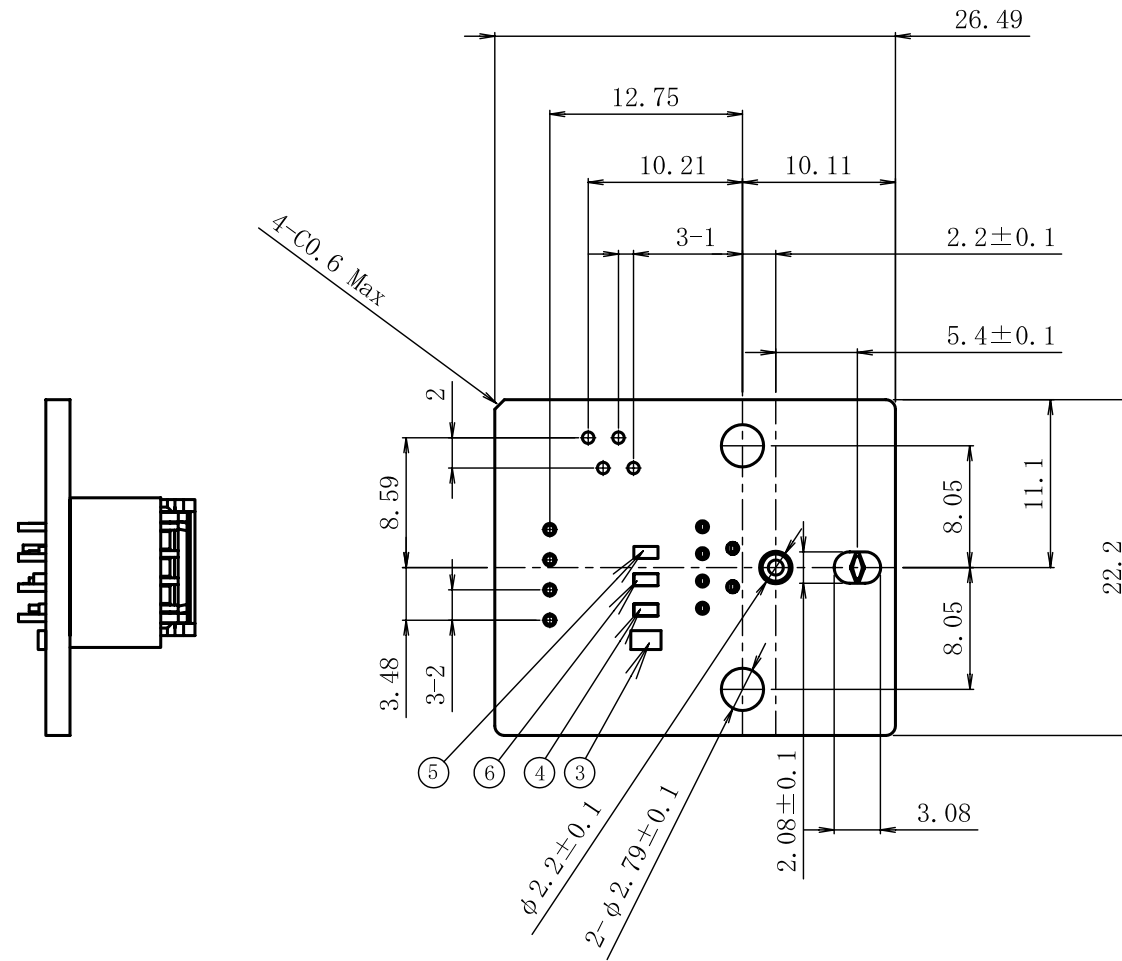
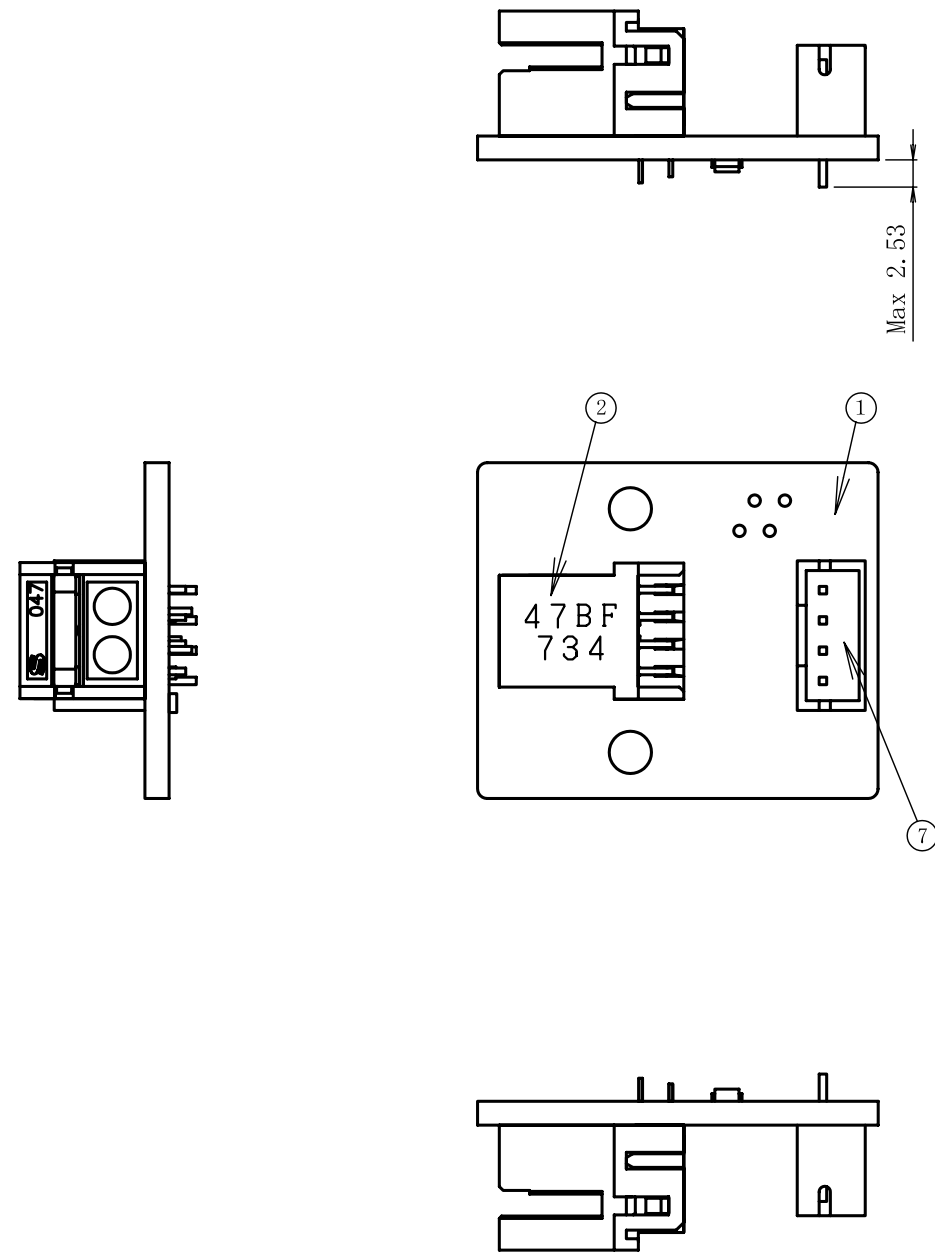
7.2 Washing material

Dust and stain shall be cleaned by air blow, or shall be cleaned by soft cloth soaked in washing materials.

And washing material to clean shall be used the below materials only.

Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

2.1 Outline (Drawing No.CY13784i02) Scale : 2/1 Unit : mm



- Note: 1. Unspecified tolerances shall be  $\pm 0.2$ . (Excepting for burrs of PWB)  
 2. Refer to the attached drawing No.CY13785i02 for U101(GP1A047RBZLF)  
 3. The encoder(U101) is fixed by glue on the PCB.  
 4. The encoder(U101) body lifting up off the PCB is Max 0.25mm,  
 the connector(J102) body lifting up off the PCB is Max 0.3mm.

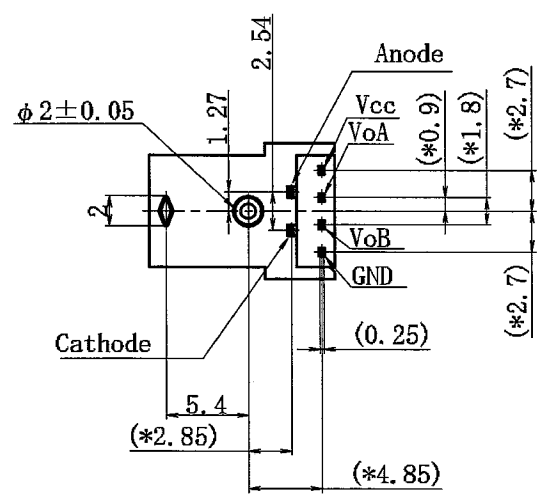
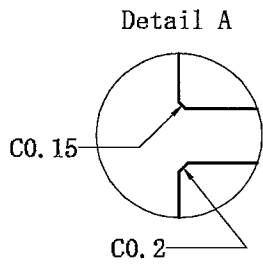
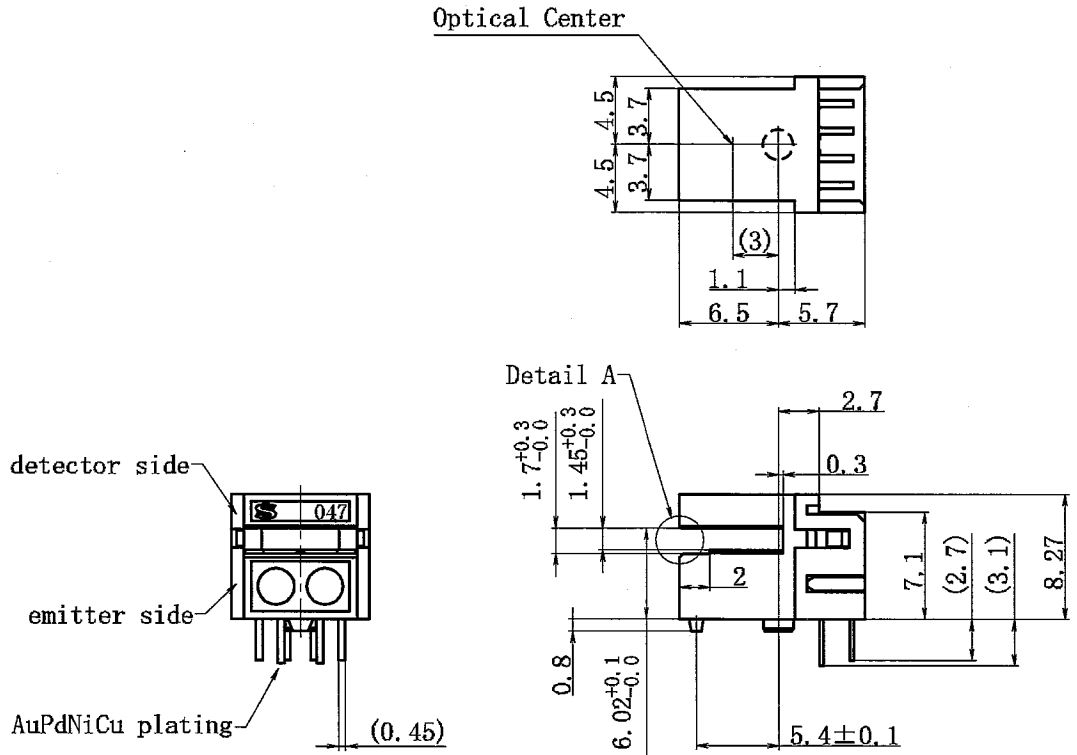
No.	Parts Name	Parts Number	Description	Manufacturer	Quantity	Reference
1	PWB ※1	AST10C	COMPOSITE EPOXY METAL 1sided, t=1.6mm, 94V-0	HT CIRCUIT	1	-
2	ENCODER	GP1A047RBZLF	150LPI	SHARP	1	U101
3	RESISTOR (SMD)	MCR10EZPF1500	150 $\Omega$ , 1%, 0.125W, 2125	ROHM	1	R101
4	RESISTOR (SMD)	MCR03EZPFX22R0	22 $\Omega$ , 1%, 0.1W, 1608	ROHM	1	R102
5	RESISTOR (SMD)	MCR03EZPJ000	0 $\Omega$ , 5%, 0.1W, 1608	ROHM	1	R103
6	CAPACITOR (SMD)	C1608X7R1E104K	0.1uF, 10%, 25V, 1608	TDK	1	C101
7	CONNECTOR	B4B-PH-K-S (LF) (SN)	4PIN, HEADER, TOP ENTRY	J. S. T	1	J102

※1. This PWB is manufactured basically by using the Gerber data sent from Lexmark in October 4, 2006.  
 (Refer to 5 attachments.)

GP3A233RBKOF

2.2 Outline (Drawing No. CY13785i02)

Scale : 2/1 Unit : mm



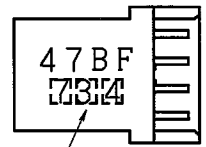
- 1) Unspecified tolerances shall be  $\pm 0.3$ .
- 2) Dimensions in parenthesis are shown for reference.
- 3) Datecode is 3digit.

(Production year)  
The last number of the year.

(Production Month)  
From 1 to 9, it mean January to September.  
X is October, Y is November and Z is December.

(Production Date)  
1 means day 1 to 8 of month.  
2 means day 9 to 16,  
3 means day 17 to 24,  
4 means day 25 to the last.

Marking



Date code

4) The dimensions indicated by \* refer to the those measured from the lead base.

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25°C

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	6	V
Low level output current	I <sub>OL</sub>	8	mA
Power dissipation *1	P <sub>o</sub>	150	mW
Operating temperature	T <sub>opr</sub>	0 to +60	°C
Storage temperature	T <sub>stg</sub>	-10 to +70	°C

\*1 The derating factors of absolute maximum ratings due to ambient temperature are shown in Fig. 1.

3.2 Electro-optical characteristics

Ta=25°C

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Operating supply voltage range	V <sub>CC</sub>	-	4.75	5.0	5.25	V	
Low level output voltage	V <sub>OL</sub>	V <sub>CC</sub> =5V, I <sub>OL</sub> =8mA	-	-	0.4	V	
High level output voltage	V <sub>OH</sub>	V <sub>CC</sub> =5V	2.4	4.9	-	V	
Supply current	I <sub>CC</sub>	V <sub>CC</sub> =5V Phases A and B both at low level	-	24	36	mA	
Transfer characteristics ※1	Duty	D <sub>A</sub>	V <sub>CC</sub> =5V f=10kHz 0.0mm < Z ≤ 1.0mm ※2	35	50	65	%
		D <sub>B</sub>					
	Phase difference	θ <sub>AB1 to 4</sub>		45	90	135	°
	Response	tr		-	200	-	ns
		tf		-	50	-	
Response frequency	f <sub>max</sub>	V <sub>CC</sub> =5V 0.0mm < Z ≤ 1.0mm ※2	-	-	60	kHz	

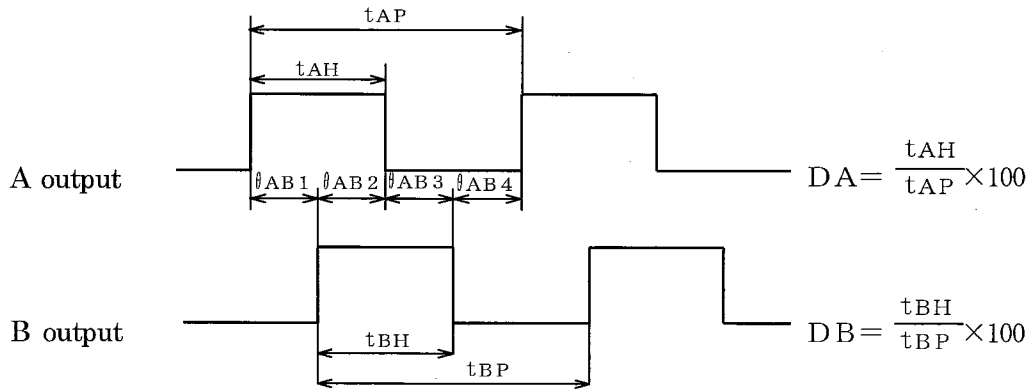
※1 The test condition is according to Fig.2 (CY13787i06)

And transfer characteristics value does not include any error of code wheel.

※2 Z stands for distance between scale surface (patterned surface) and detector holder surface, and patterned surface shall be arranged face to face with detector holder surface.

Note: It is recommended that the GP3A233RBK0F be used under the condition of typical V<sub>CC</sub>=5V for which it is designed.

3.3 Output waveform



Refer to note 1 in Fig.2 (CY13787i06) for the rotation direction of code wheel.

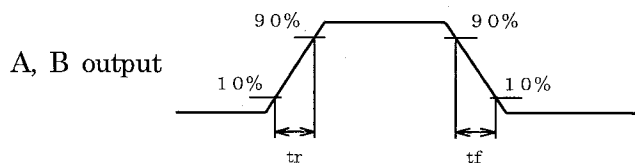
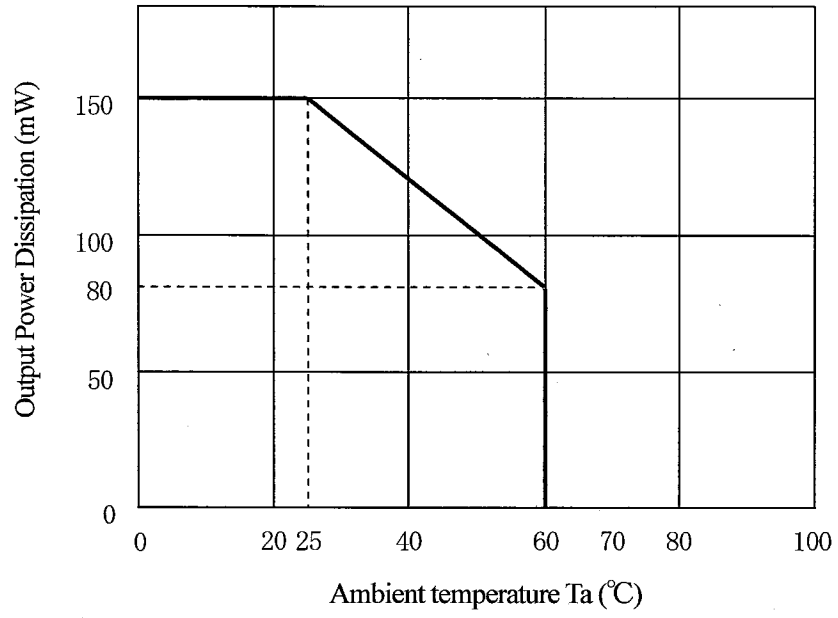


Fig.1 Output power dissipation v.s. ambient temperature

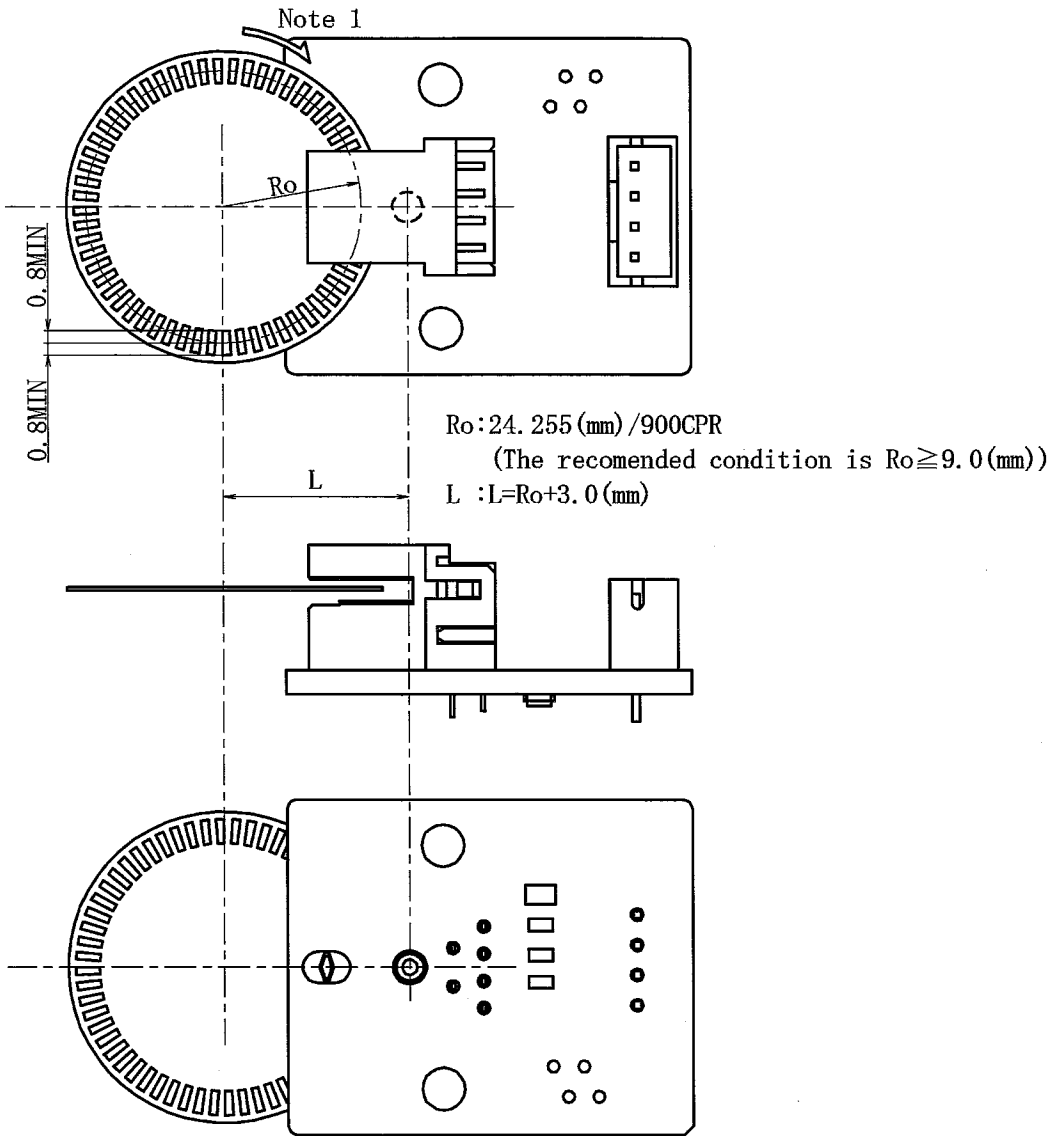




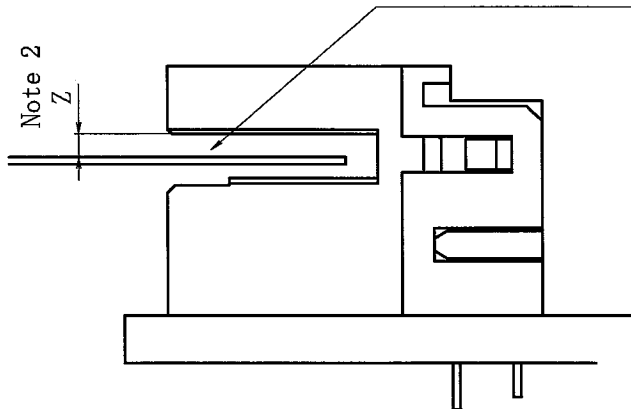
GP3A233RBKOF

Fig.2 GP3A233RBKOF Test Condition (Drawing No.CY13787i06)

Scale : Free Unit : mm

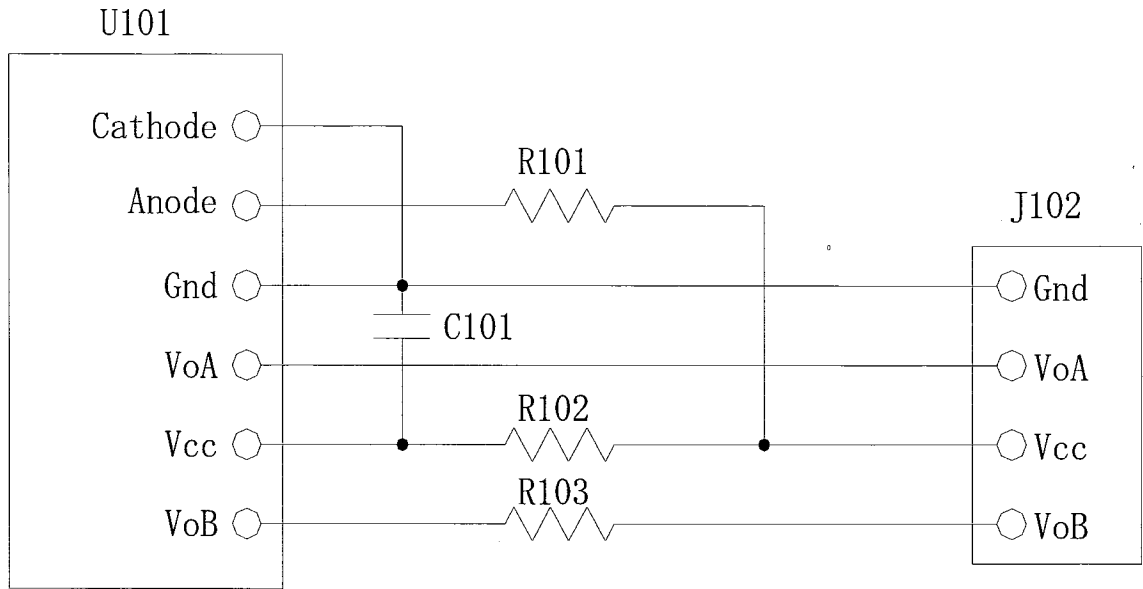


Please make sure the codewheel surface.  
(slit patterned surface) is upper side (Detector side) in the side.



- Note 1) The rotation direction of codewheel against output waveform (Refer to 3.3).  
2) Distance between codewheel surface (patterned surface) and detector holder surface.

Fig.3 Connection Diagram (Drawing No.CY13788i08)



## 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 -10°C to +70°C (30min) (30min) 20 cycles test	$V_{OL} \geq U \times 1.2$ $V_{OH} \leq L \times 0.8$	n=22, c=0
High temp. and high humidity storage	+40°C, 90%RH, 240h	$I_{CC} \geq U \times 1.2$	n=22, c=0
High temp. storage	+70°C, 240h	Duty : Shall be within the specification values. U: Upper specification limit L: Lower specification limit	n=22, c=0
Low temp. storage	-10°C, 240h		n=22, c=0
Operation life	$V_{CC}=5V, T_a=25^\circ C, 500h$		n=22, c=0
Mechanical shock	1000m/s <sup>2</sup> 3 times/ X, Y, Z direction		n=11, c=0
Variable frequency vibration	Overall amplitude ; 1.5mm Frequency range ; 10 to 55 to 10 Hz/1min. 2h/ X, Y, Z direction		n=11, c=0

\* Test conditions shall be based upon the specification.

## 5. Outgoing inspection

## 5.1 Inspection items

## (1) Electrical characteristic

$V_{OL}, V_{OH}, I_{CC}, D_A, D_B, \theta_{AB1 \text{ to } 4}$

## (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, Unreadable marking,	0.4
Minor defect	Appearance defect except the above mentioned.	1.0

## 6. Supplements

## 6.1.1 Parts (GP3A233RBK0F)

This product uses the below parts.

Part Name	Part Number	Description	Manufacture	Quantity	Reference
Encoder	GP1A047RBZLF ※1	150LPI	SHARP CORP.	1	U101
PWB	AST10C	COMPOSITE EPOXY METAL 1Sided,t=1.6mm,94V-0	HT CIRCUITS Ltd.	1	-
RESISTOR	MCR10EZPF1500	150Ω,1%,0.125W,2125 Size	ROHM CORP.	1	R101
	MCR03EZPFX22R0	22Ω,1%,0.1W,1608 Size	ROHM CORP.	1	R102
	MCR03EZPJ000	0Ω,5%,0.1W,1608 Size	ROHM CORP.	1	R103
CAPACITOR	C1608X7R1E104K	0.1uF,10%,25V,1608 Size	TDK CORP.	1	C101
CONNECTOR	B4B-PH-K-S(LF)(SN)	4PIN,HEADER,TOP ENTRY	J.S.T. Mfg. Co., Ltd.	1	J102

## 6.1.2 Parts (GP1A047RBZLF) ※1

GP1A047RBZLF uses the below parts

## 6.1.2.1 Light detector (Quantity : 1)

(Using a silicon photodiode as light detecting portion, and a bipolar IC as signal processing circuit.)

Type	Maximum sensitivity wavelength (nm)	Sensitivity wavelength (nm)	Response time (μs)
Photodiode	780	400 to 1200	16.7

## 6.1.2.2 Light emitter (Quantity : 1)

Type	Material	Maximum light emitting wavelength (nm)
Infrared light emitting diode (Non-coherent)	AlGaInP /GaAs	652

## 6.1.2.3 Material

Holder	Bottom cover	Lens holder
Black polycarbonate resin (GF 10% content)	Black polycarbonate resin (GF 10% content)	Transparent polycarbonate resin

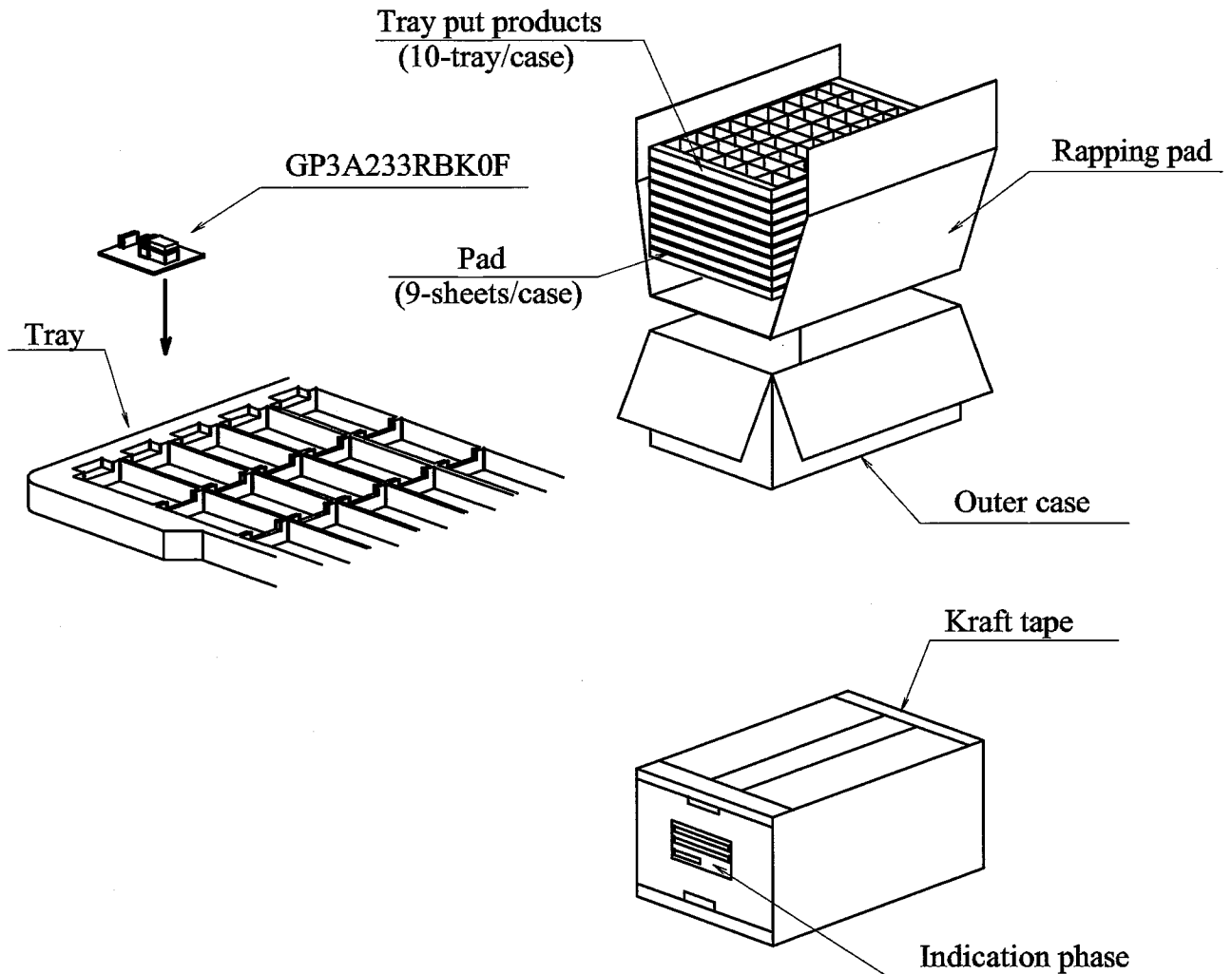
Lead plating
Au-Pd-Ni-Cu

## 6.1.3 Others

This product shall not be proof against radiation flux.

Laser generator is not used.

6.2 Packing (Drawing No. : CY13789i09)



1) Package materials

- Outer package : Outer case (Paper corrugated cardboard)
- Inner package : Pad (Polyethylene)  
Rapping pad (Polyethylene )  
Tray (Polysthyrene)

2) Packaging number

- Max. 50 pices per tray
- Max. 500 pices per case

3) Package specifications

- Put them (10 trays put GP3A233RBK0F) in the outer case.
- Put pads between them, and put rapping pad on their top and bottom.
- Closes the lid of outer case and seals with kraft tapes.

4) Indication items

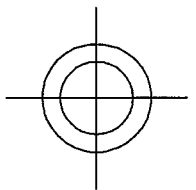
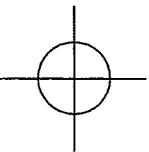
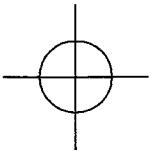
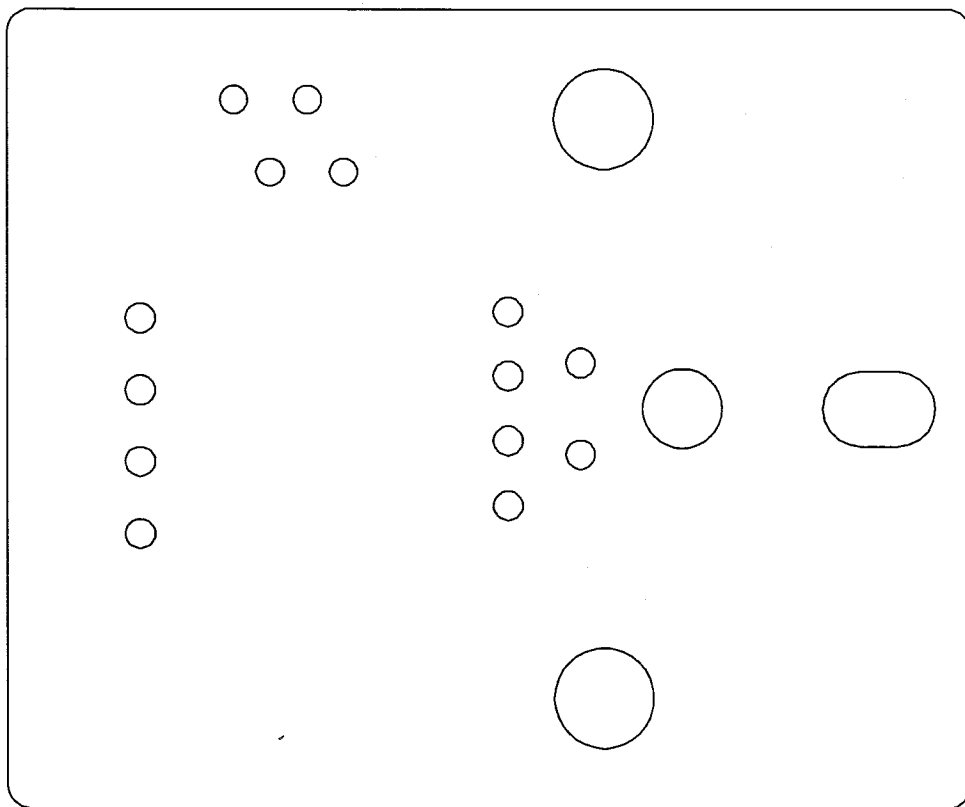
- Indicates "Model No.", "Quantity" and "Packing Date" on the outer case.

5) Regular packing mass

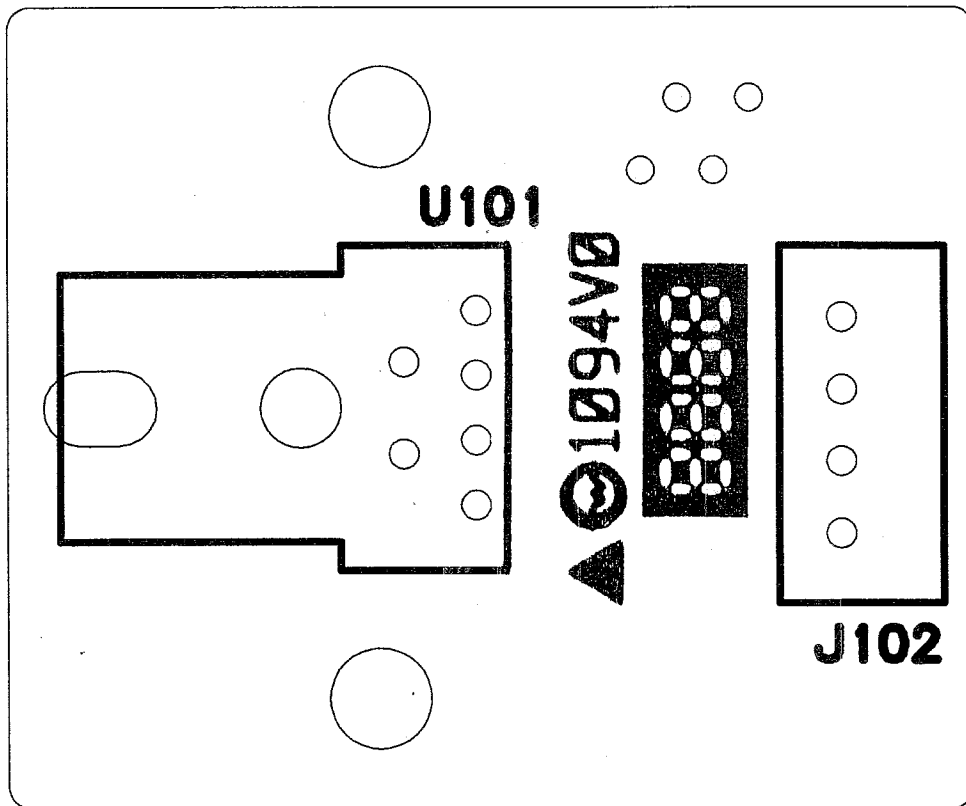
(Excluding fractions, however above packing material, packing count, packing style)

- Approximately 2.3 kg

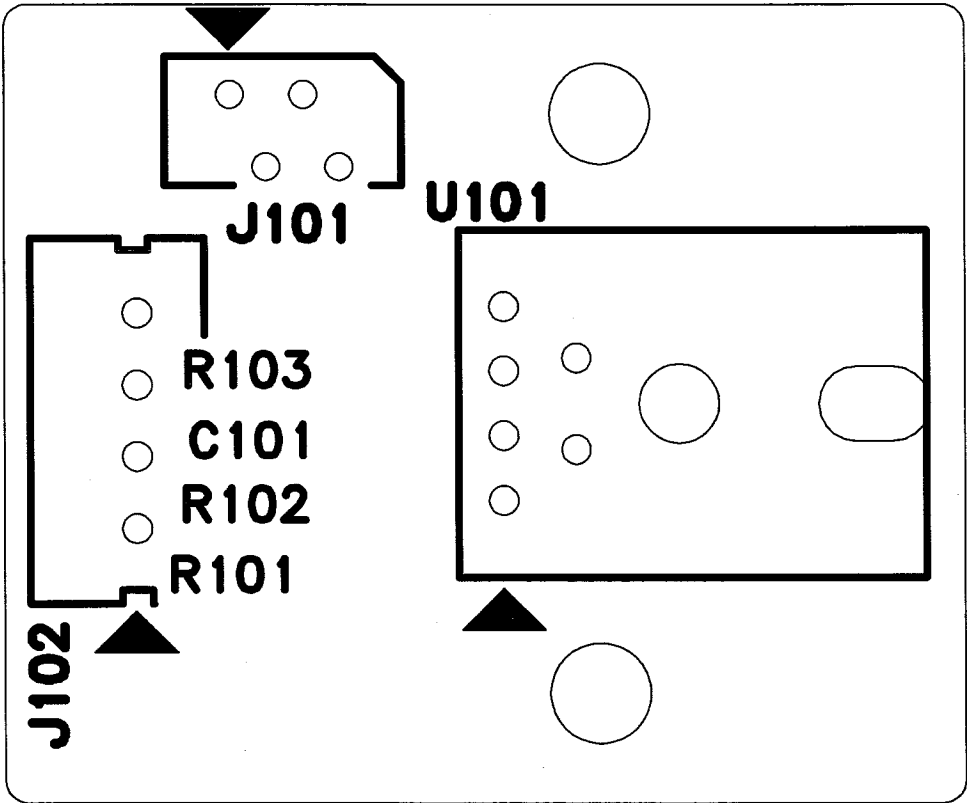
PWB OUTLINE (VIEW FROM BACK SIDE) SCALE FREE



PWB SILK (VIEW FROM FRONT SIDE) SCALE FREE

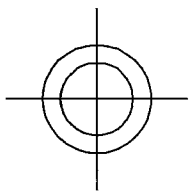
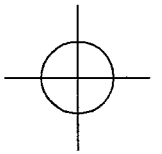
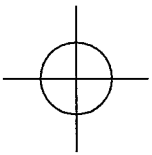
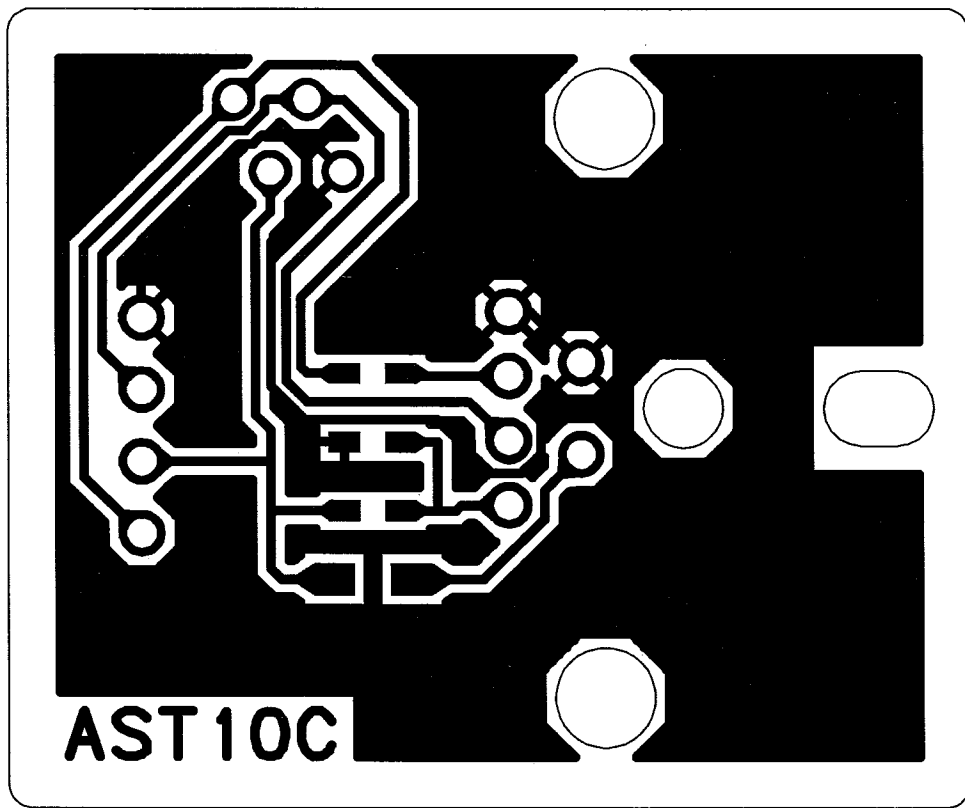


PWB SILK (VIEW FROM BCK SIDE) SCALE FREE





PWB PATTERN (VIEW FROM BACK SIDE) SCALE FREE



PWB SOLDER MASK (VIEW FROM BACK SIDE) SCALE FREE

