< Specifications (Precautions and Prohibitions) >

• Precaution for circuit design

1) The products are designed and produced for application in ordinary electronic equipment (AV equipment, OA equipment, telecommunication equipment, home appliances, amusement equipment, etc.).
If the products are to be used in devices requiring extremely high reliability (medical equipment, transport equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or operational error may endanger human life and sufficient fail-safe measures, please consult with the ROHM sales staff in advance. If product malfunctions may result in serious damage, including that to human life, sufficient fail-safe measures must be taken, including the following:

[a] Installation of protection circuits or other protective devices to improve system safety
[b] Installation of redundant circuits in the case of single-circuit failure

2) The products are designed for use in a standard environment and not in any special environments. Application of the products in a special environment can deteriorate product performance. Accordingly, verification and confirmation of product performance, prior to use, is recommended if used under the following conditions:
[a] Use in various types of liquid, including water, oils, chemicals, and organic solvents
[b] Use outdoors where the products are exposed to direct sunlight, or in dusty places
[c] Use in places where the products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
[d] Use in places where the products are exposed to static electricity or electromagnetic waves
[e] Use in proximity to heat-producing components, plastic cords, or other flammable items
[f] Use involving sealing or coating the products with resin or other coating materials
[g] Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering
[h] Use of the products in places subject to dew condensation

3) The products are not radiation resistant.

4) The Company is not responsible for any problems resulting from use of the products under conditions not recommended herein.

5) The Company should be notified of any product safety issues. Moreover, product safety issues should be periodically monitored by the customer.

6) De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta).
When used in sealed area, confirm the actual ambient temperature.

7) Confirm that operation temperature is within the specified range described in product specification.

8) Failure induced under deviant condition from what defined in the product specification can not be guaranteed.

9) When product safety related problems arises, please immediately inform to ROHM, and consider technical counter measure.

< Specifications (Precautions and Prohibitions) >

● Precaution for Mounting / Circuit board design

1) When a highly active halogenous (chlorine, bromine, etc.) flux is used, the remainder of flux may negatively affect product performance and reliability.

2) The principle of soldering will be reflow solder.

3)Please read the Handling Precautions for Sensor as attached when you design.

● Precautions Regarding Application Examples and External Circuits

1) If change is made to the constant of an external circuit, allow a sufficient margin due to variations of the characteristics of the products and external components, including transient characteristics, as well as static characteristics.

2) The application examples, their constants, and other types of information contained herein are applicable only when the products are used in accordance with standard methods. Therefore, if mass production is intended, sufficient consideration to external conditions must be made.

● Precaution for Electrostatic

This product is Electrostatic sensitive product, which may be damaged due to Electrostatic discharge. Please take proper caution during manufacturing and storing so that voltage exceeding Product maximum rating won't be applied to products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

● Precaution for Stroge / Transportation

1) Product performance and soldered connections may deteriorate if the products are stored in the following places:
   [a] Where the products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [b] Where the temperature or humidity exceeds those recommended by the Company
   Temperature: 5℃- 30℃, Humidity less than 60%
   [c] Storage in direct sunshine or condensation
   [d] Storage in high Electrostatic

2) Even under ROHM recommended storage condition, solderability of delivery over 1 year old may be degraded.
   It is strongly recommended to confirm solderability before using products of which storage time is exceeding recommended storage time period .
   ・Recommended storage condition: Temperature 5℃- 30℃, Humidity less than 60%

3) Store / transport cartons in the correct direction, which is indicated on a carton as a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

< Specifications (Precautions and Prohibitions) >

● Precaution for product label

QR code printed on ROHM product label is only for internal use, and please do not use at customer site.
It might contain a internal part number that is inconsistent with an product part number.

● Precaution for disposition

When disposing products please dispose them properly with a industry waste company.

●Precaution for Foreign exchange control regulation

1) ROHM has not determined whether or not the products are considered "a controlled product or labor " as specified in the Foreign Exchange and Foreign Trade Control Law.
Accordingly, if exportation of the products, either separately or integrated in another company's products, is intended, or giving the products to persons who are not residents is planed, additional steps are required, based upon the appropriate regulations.

● Prohibitions Regarding Industrial Property

1) These Specifications contain information related to the ROHM industrial property. Any use of them other than pertaining to theusage of appropriate products is not permitted. Duplication of these Specifications and its disclosure to a third party without the Company's permission is prohibited.

2) Information and data on products, including application examples, contained in these specifications are simply for reference; the Company does not guarantee any industrial property rights, intellectual property rights, or any other rights of a third party regarding this information or data. Accordingly, the Company does not bear any responsibility for:
[a] infringement of the intellectual property rights of a third party
[b] any problems incurred by the use of the products listed herein.

3) The Company prohibits the purchaser of its products to exercise or use the intellectual property rights, industrial property rights, or any other rights that either belong to or are controlled by the Company, other than the right to use, sell, or dispose of the products.

● Precautions on Use of Products

1) Verification and confirmation of performance characteristics of products, after on-board mounting, is advised.

2) In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse) is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

● Other Matters

1) Please sign these Specifications and return one copy to the Company.
If a copy is not returned within three months after the issued date specified on the front page of these Specifications, the Company will consider the Specifications accepted.

2) If any matter related to these Specifications needs to be clarified, discussions shall be held promptly between the two parties concerned to determine the issue.

1. Part number RPI-1133

2. Construction GaAs Infrared light emitting diode, silicon planar type photoIC

3. Application All kinds of controller

4. Outline dimensions Fig-1

5. Absolute max. ratings(Ta=25□)

Input (infrared light emitting diode)

Forward current	I_F	· · · · ·	50 mA
Reverse voltage	V_R	· · · · ·	5 V
Power dissipation	P_D	· · · · ·	80 mW

Output (Phototransistor)

Power supply voltage	V_{CC}	· · · · ·	7 V
Output current	I_O	· · · · ·	10 mA
Power dissipation	P_D	· · · · ·	80 mW
Operating temperature	T_{opr}	· · · · ·	-20 ~ +60 ℃
Storage temperature	T_{stg}	· · · · ·	-40 ~ +100 ℃

6. Electrical optical characteristics

1) Input characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	V_F	—	1.1	1.3	V	I_F = 10 mA
Reverse current	I_R	—	—	10	μA	V_R = 5 V
Peak light emitting wavelength	λp	—	950	—	nm	I_F = 50 mA

*Non-coherent Infrared light emitting diode used.

2) Output characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Power supply voltage	V_{CC}	2	—	7.0	V	—
Output low level voltage	V_{OL}	—	0.08	0.35	V	V_{CC} = 3 V I_{OL} = 2 mA
Output high level voltage	V_{OH}	2.8	—	3.0	V	V_{CC} = 3 V I_F = 0 mA
Low level power supply current	I_{CCL}	—	0.35	1.5	mA	V_{CC} = 3 V I_F = 5 mA
High level power supply current	I_{CCH}	—	0.35	1.5	mA	V_{CC} = 3 V I_F = 0 mA

3) Transfer characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Condition
High→Low Threshold input current		I_{FHL}	0.25	—	2.5	mA	V_{CC} = 3 V
Hysteresis		I_{FLH}/I_{FHL}	0.4	0.7	0.9	—	V_{CC} = 3 V
Response time	Low→High Propagation delay time	T_{PLH}	—	22	66	μs	V_{CC} = 3 V I_F = 5 mA R_L = 100kΩ
	High→Low Propagation delay time	T_{PHL}	—	5.5	16	μs	
	Rise time	tr	—	5	15	μs	
	Fall time	tf	—	0.05	0.15	μs	

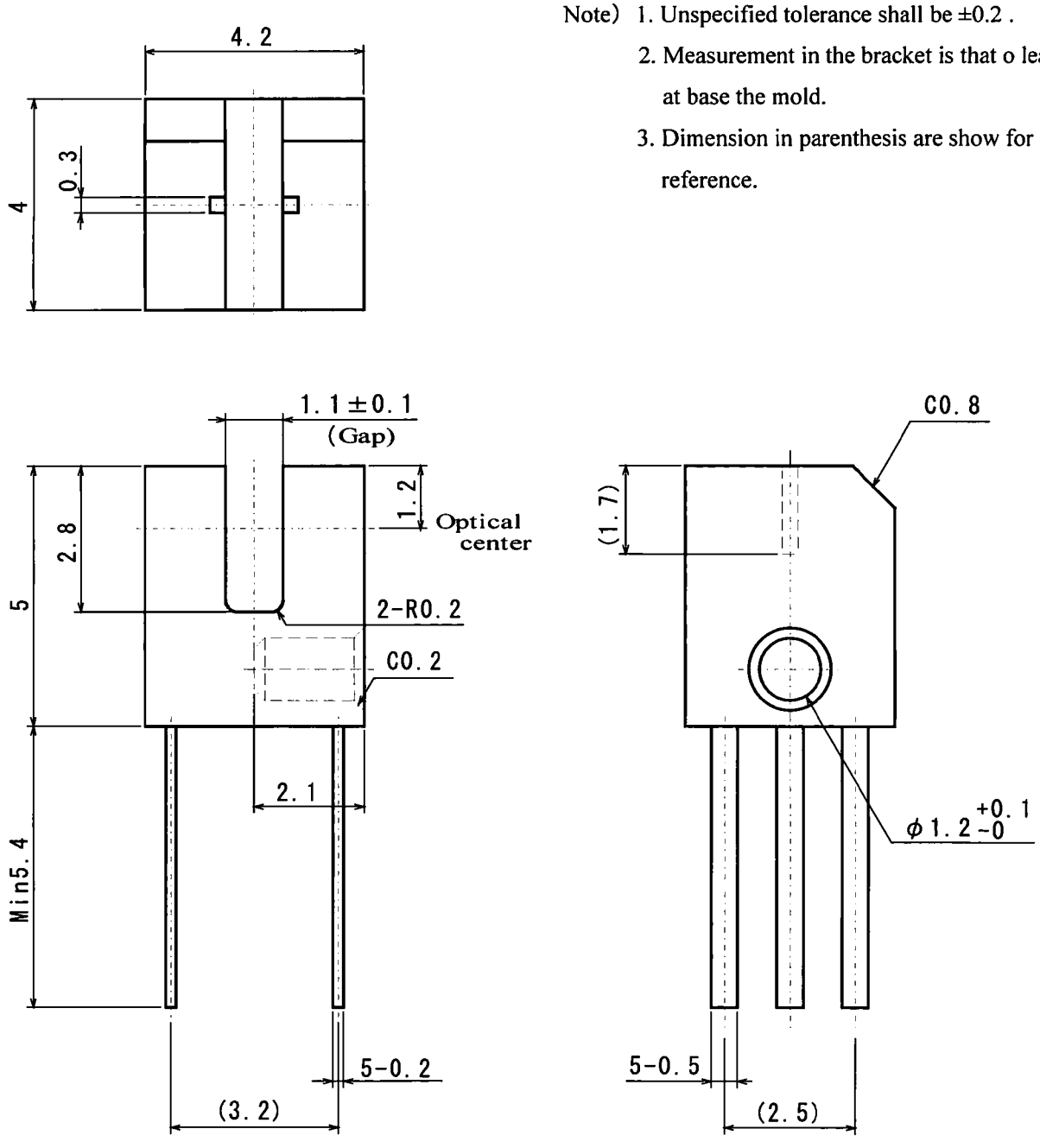
4) Threshold input current of rank

Rank	Threshold input current : I_{FHL}(mA)
A	0.25～1.20
B	1.00～2.50

7. Weight About 0.15 g/piece

Fig-1 Outline dimension

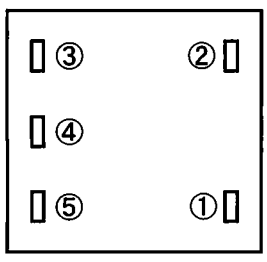
Unit:mm



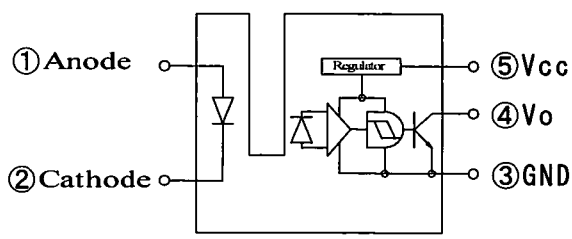
Note) 1. Unspecified tolerance shall be ±0.2 .

2. Measurement in the bracket is that o lead pin at base the mold.

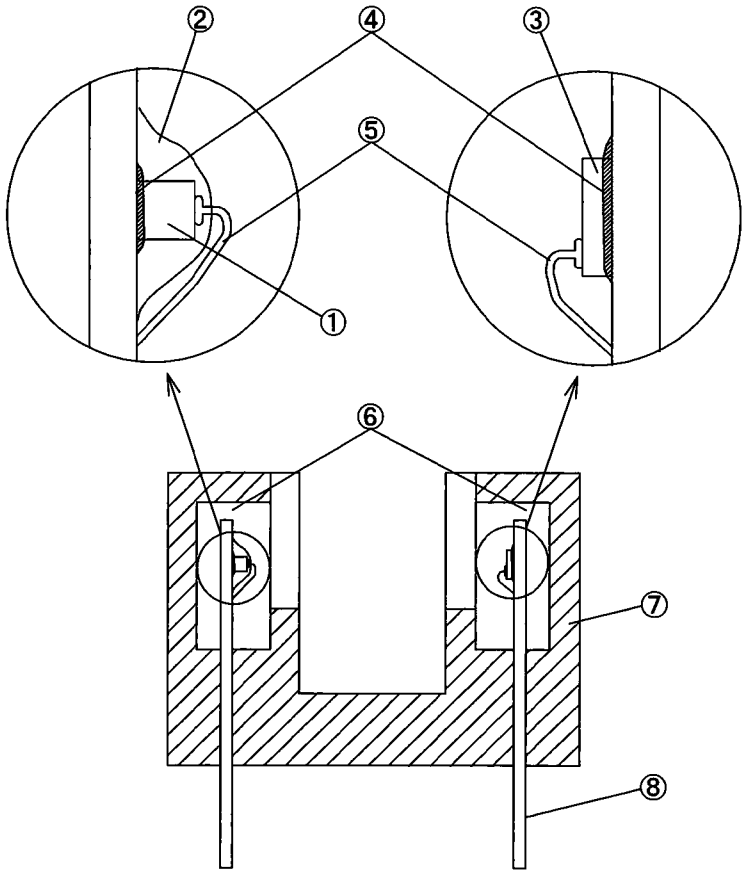
3. Dimension in parenthesis are show for reference.



Internal connection diagram

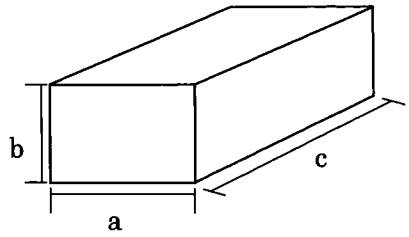


Structure fig.



No.	Name	Material
1	Infrared light emitting diode	GaAs
2	Silicone	Silicone
3	Photo IC	Si
4	Conductive epoxy resin	Ag+Epoxy resin
5	Bonding wire	Au
6	Mold resin	Epoxy resin
7	Mold resin	PPS
8	Lead	Material : Fe Plating : Sn-Ag-Cu

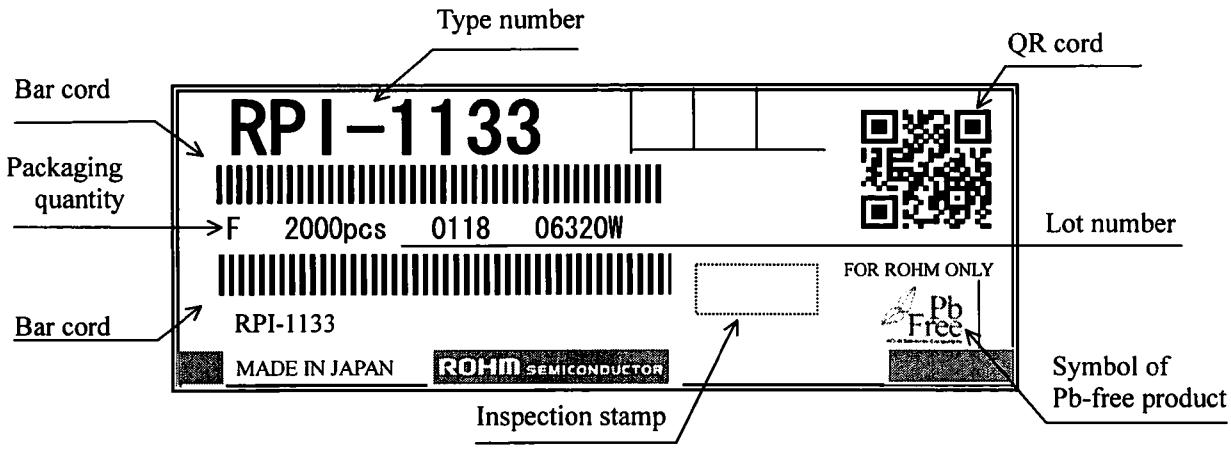
Packaging requirements



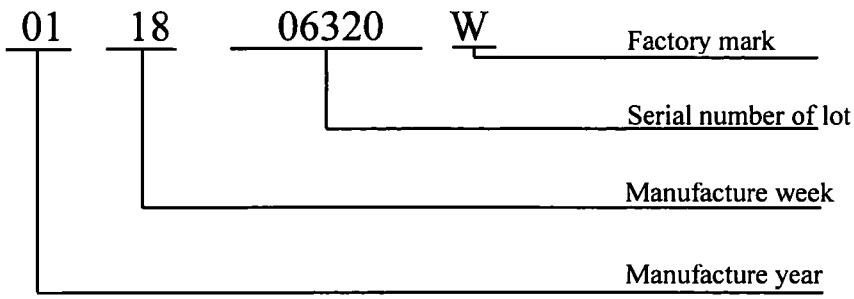
1. Packaging
   (1) A poly-bag pack of 250pcs.
   (2) A paper box pack of 8poly-bags.
   Paper box size;(a)×(b)×(c)=100×70×170(mm)

2. Label indication
   The following information shall be described on a boxlabel; ROHM type number, packaging quantity,lot number,inspevtion stamp.

[Example]



[Example of lot number marking]



3. Factory ROHM・WAKO CO.,LTD.
   ROHM SEMICONDUCTOR (CHINA) CO.,LTD.

Feb 29, 2012

Ver.S004

Optical Module Div.

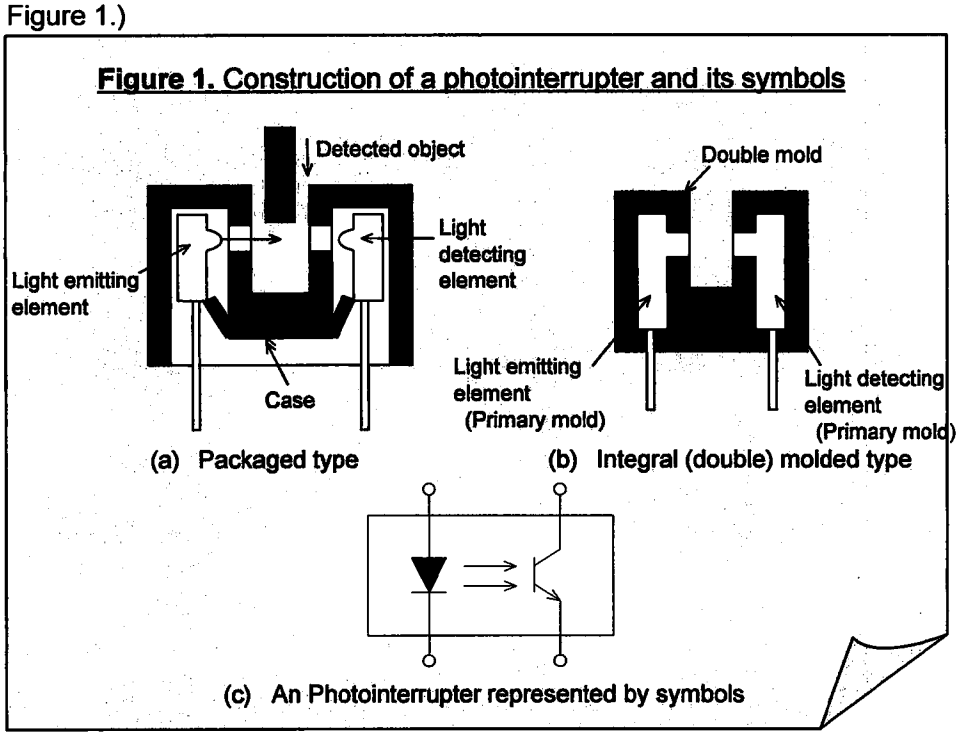
Handling Precautions for Sensors

A photointerrupter is a packaged product that consists of a pair of light emitting and detecting elements facing each other. Photointerrupters are also called transmission photodetectors since objects are detected when they pass through the area between the two elements to block the light beam. ROHM calls such transmission type detectors "interrupters."

Photointerrupters use GaAs infrared LEDs that feature strong light emission and a long service life as a light emitting element, and use mainly single-phototransistors or photo ICs as a light detecting element.

Photointerrupters, in a broad sense, are divided into packaged (housed) types and double molded types. (See Figure 1.)

Figure 1. Construction of a photointerrupter and its symbols



A packaged type photointerrupter, used most commonly, is contained in a molded (injection molded) case, which contains a pair of light emitting and light detecting elements. A double molded type, on the other hand, is a product developed responding to the recent needs of compact-size photointerrupters.

For improved light emitting/detecting efficiency, the resin used for the molds of our photointerrupters' light emitting/detecting elements is epoxy resin of a high degree of purity, with the minimal use of fillers. Because of this, compared with resins used in ICs and transistors, it may exhibit slightly poor performance in thermal resistance, mechanical strength, and solvent resistance. Therefore, you should consider the following points when designing, handling or packaging the photointerrupters.

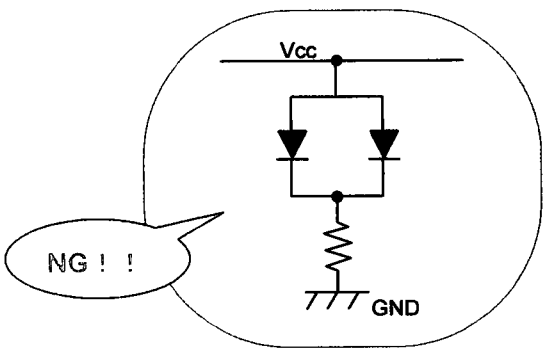
1. Precautions for Circuit Designing

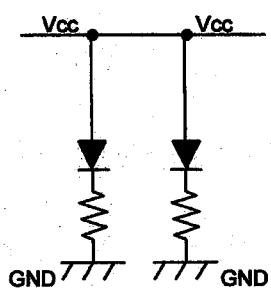
A. ◦ The load resistance on the phototransistor side should be determined by the customer since the working current in an infrared LED varies from one application to another. If the load resistance is improperly selected, problems such as the malfunction of assembled sets will occur.

◦ The main point is the testimation of the Maximum and the minimum radiation strength. That is the maximum dark current, threshold voltage and a half-strength of radiation strength.

◦ To prevent this, in circuit designing, you should always read the information attached as "Reference Material 1," which describes the method of determining a correct load resistance value.

B. The phototransistor will not work when using only one resistance for two parallel phototransistors.





Independence style method
【Recommendation method】

2. Lead Forming

(1) Lead pins should be formed as clamped with a bending tool. Avoid bending lead pins by using their root sections as a fulcrum.

(2) Lead pins should be bent at a distance of at least 2 mm from their root sections.

(3) Lead forming should be conducted prior to soldering.

(4) Repeatedly bending lead pins at the same points should be avoided.

3. Lead Cutting

Cutting leads at high temperatures may cause wire breakage. Always conduct lead cutting at ordinary temperatures.

4. Mounting

(1) Lead pins must have the same pitch as that of the fitting holes on the substrate. Do not bend lead pins to expand or reduce the pin pitch when mounting ICs to a substrate.

(2) If a holder etc. is used to position ICs, consider the dimensional tolerances of the holder, the substrate, and the product to prevent the stress to the lead pins.

※ Note) Note the thermal inflation coefficient of each material in use.
In preheating and soldering, the holder inflates due to heat and then shrinks, which applies stress to the lead pins and possibly causes wire breakage.

5. Soldering

The recommended soldering conditions are given below:

Item	Conditions	Soldering temperature	Operation time
Solder dipping	Conducted at a distance of 1.0mm from the resin	Preheating below 100-105℃ (Max 30±5 SEC) 260°C or lower	5 seconds or shorter
Soldering iron	Conducted at a distance of 1.0mm from the resin Wattage: 30 W or lower Tip diameter: 3 mm or shorter	380°C or lower	3 seconds or shorter (2times)
Reflow soldering	Reflow soldering is not permitted.		

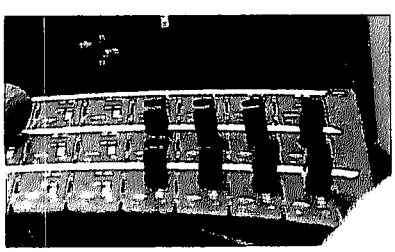
* Use rosin-based flux only. Note that strongly acid or alkaline flux may cause corrosion.
* The surface mount devices reguire special attention. Please check requested time control after opening sealed bug,land pattern,the thickness of solder paste screen etc.

6. About PCB division

- The case insertion type is weaker than double mold type ; due to its structure , it is weak to stresses (bending · drop)

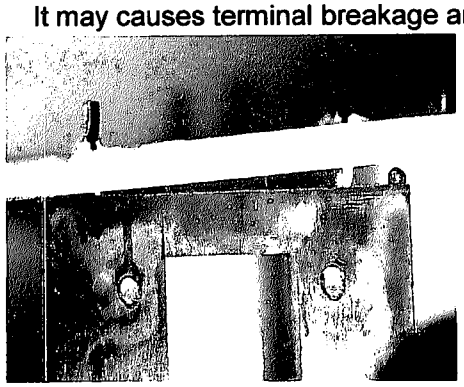
  Hence,please do not use hands directly when removing each PCB as shown on picture.

  Please use proper equipments to avoid any stresses to PCB(components.)



- After soldering,please do not make any strength test to the case insertion type.

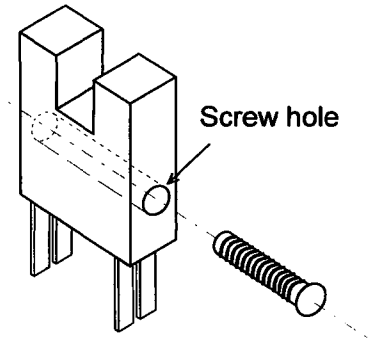
  It may causes terminal breakage and/or case removals.



7. Attention in products mounting

Double molded interrupter

- RPI－131
- RPI－243
- RPI－246



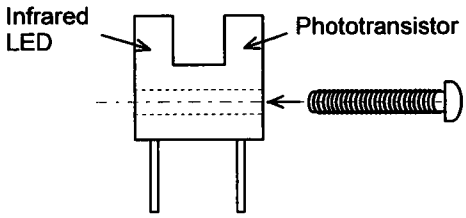
As for the above type, there is the possibility that makes electrically short-circuit between parts to Metal mounting plate, when tighten at the time of attachment and torque be strong. Especially attention to the following point and please use.

① Screw・・・・・・・・・・・・M1.4 screw head φ2.5㎜
(Plastic production recommendation)

② Tightening torque・・・・・・・0.049N·m～0.078N·m
(Attention to strong tightening)

③ Insertion direction・・・・・・・Insert a screw from the phototransistor side.

④ Metal mounting plate ・・・・Do not short-circuit to VCC and GND.



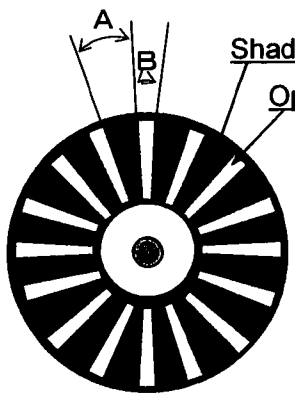
8. Rules of the speed operating and the response time

You need to be careful about the response time of photo interrupter during the high-speed switching.

In case of using photo interrupter as positioning control chip by on – off with μSEC order, you should take a margin according to the response time that is written on our website.

In case of using photo interrupter at high-speed, you should lower the resistance value to control. Consequently you should lower the resistance value of infrared side and send more electric current.

When you use the slit as shade the light, you should make the shade part 3～10% bigger against the width of slit of interrupter.



Shading the lighting

Open lighting (Window open)

※ A : B = 103 ～ 110 : 100

※ A > The width of slit of interrupter

Thank you if you would contact to the following, if there is the question/question etc. regarding this case.

ROHM CO., LTD.
Quality Control Dept. Optical Module Div.

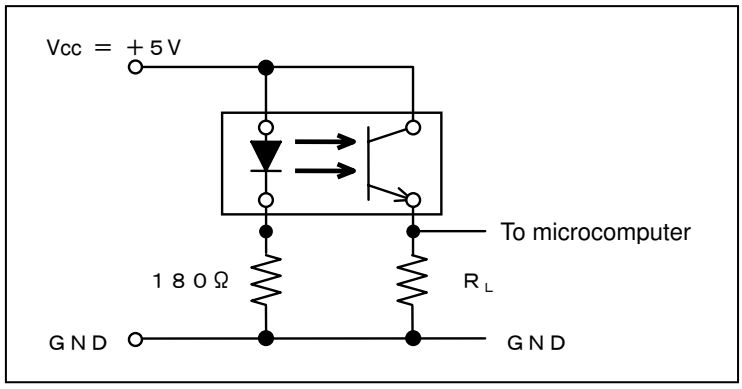
TEL : (075) 321 - 1294
E-mail : display@rohm.co.jp

＜Reference Material 1＞

Load Resistance Calculation Example

※Load Resistance Calculation Example is calculated as an example of RPI-221.

Ⅰ. Customer's Circuit



Ⅱ. Forward Current IF in Customer's Circuit

$$I_F = \frac{5.0V - 1.3V}{180\Omega} = 20.6mA$$

Infrared Emitting Diode
V_F= 1.3 V

Ⅲ. Minimum Value of Collector Current IC in Customer's Circuit

ROHM SPEC ・・・ V_{CC} = 5 V I_C Min= 0.2 m

(From specifications) I_F = 20 mA

Customer's circuit ・・・ V_{CC} = 5 V

I_F = 20.6 mA

- Minimum value of collector current Ic when IF is 20.6 mA

$$I_C = 0.2mA \times \frac{20.6mA}{20mA} = 0.21mA$$

- Taking into consideration the changes in characteristics due to aging*, the light emitting capacity of an infrared LED decreases approx. 50% if used for 10 years.

I_C Min = 0.21 × 0.5 = 0.105 mA

I_C Min = 0.105 mA

* The characteristics of the infrared LED used for photointerrupters changes due to aging and therefore there is a limitation in its service life. If the input current is maintained lower than the rated input, the officially announced service life of an infrared LED is 100,000 hours, assuming that the life of an infrared LED completes when its light emitting capacity is decreased to 50% of its initial value. Therefore, a sufficient allowance must be provided in designing photointerrupters.

- If the threshold voltage in customer's circuit is

{ V_{Hi} 3.8 V or higher and
V_{LO} 1.0 V or lower (our estimation value), }

then the load resistor RL must be the one that satisfies it.

Ⅳ. Minimum Value of Load Resistance RL

$V_{Hi} < I_C \text{ Min} \times R_L \text{ Min})$

$3.8V < 0.1105mA \times R_L \text{ Min}$

$$R_L \text{ Min} > \frac{3.8V}{0.000105A}$$

$R_L \text{ Min} > 36k\Omega$

Ⅴ. Maximum Value of Load Resistance RL

Assume that the maximum value of dark current Iceo (Iceo max) is 10 μA, then:

$V_{OL} > I_{CEO} \text{ Max} \times R_L \text{ Max}$

$1.0V > 10\mu A \times R_L \text{ Max}$

$$R_L \text{ Max} < \frac{1.0V}{0.00010A}$$

$R_L \text{ Max} < 100k\Omega$

Ⅵ. From the above calculations, the following load resistance range is obtained:

$$36k\Omega < R < 100k\Omega$$