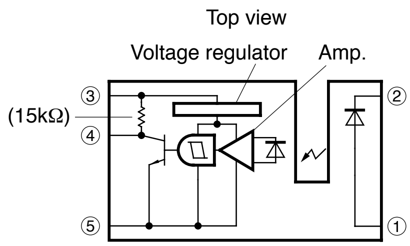
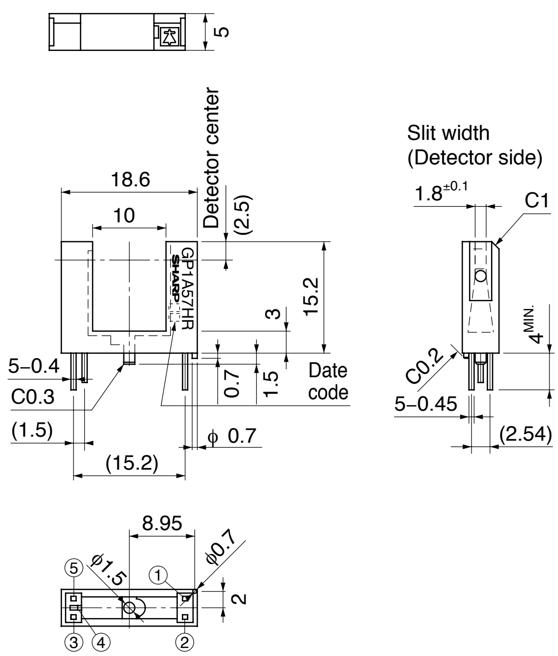
■ Internal Connection Diagram



① Anode
② Cathode
③ V_{CC}
④ V_O
⑤ GND

■ Outline Dimensions

(Unit : mm)



• Tolerance : ±0.2mm
• ( ) : Reference dimensions

Product mass : approx. 0.7g

Dip soldering material : Sn−3Ag−0.5Cu

Date code (2 digit)

1st digit		2nd digit	
Year of production		Month of production	
A.D.	Mark	Month	Mark
2000	0	1	1
2001	1	2	2
2002	2	3	3
2003	3	4	4
2004	4	5	5
2005	5	6	6
2006	6	7	7
2007	7	8	8
2008	8	9	9
2009	9	10	X
2010	0	11	Y
:	:	12	Z

repeats in a 10 year cycle

Country of origin

Japan, Indonesia or Philippines
(Indicated on the packing case)

■ Absolute Maximum Ratings

(T_a=25˚C)

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	50	mA
	*1, 2 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	75	mW
Output	Supply voltage	V_{CC}	–0.5 to +17	V
	Output current	I_O	50	mA
	Power dissipation	P_O	250	mW
Operating temperature		T_{opr}	–25 to +85	˚C
Storage temperature		T_{stg}	–40 to +100	˚C
*3 Soldering temperature		T_{sol}	260	˚C

*1 Refer to Fig. 1, 2, 3
*2 Pulse width ≤ 100μs, Duty ratio=0.01
*3 For 5s or less

■ Electro-optical Characteristics

(T_a=25˚C)

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_F	I_F=7mA	–	1.14	1.4	V
	Reverse current	I_R	V_R=3V	–	–	10	μA
Output	Operating supply voltage	V_{CC}	–	4.5	–	17	V
	Low level output voltage	V_{OL}	V_{CC}=5V, I_{OL}=16mA, I_F=0	–	0.15	0.4	V
	High level output voltage	V_{OH}	V_{CC}=5V, I_F=7mA	4.9	–	–	V
	Low level supply current	I_{CCL}	V_{CC}=5V, I_F=0	–	1.7	3.8	mA
	High level supply current	I_{CCH}	V_{CC}=5V, I_F=7mA	–	0.7	2.2	mA
Transfer characteristics	*4 "Low→High" threshold input current	I_{FLH}	V_{CC}=5V	–	1	7	mA
	*5 Hysteresis	I_{FHL}/I_{FLH}	V_{CC}=5V	0.55	0.75	0.95	–
	*6 Responce time: "Low→High" Propagation delay time	t_{PLH}	V_{CC}=5V, I_F=7mA, R_L=280Ω	–	3	9	μs
	*6 Responce time: "High→Low" Propagation delay time	t_{PHL}		–	5	15	
	*6 Responce time: Rise time	t_r		–	0.1	0.5	
	*6 Responce time: Fall time	t_f		–	0.05	0.5	

*4 I_{FLH} represents forward current when output goes from "Low" to "High".
*5 I_{FHL} represents forward current when output goes from "High" to "Low".
*6 Test circuit for response time is shown in Fig.12.

Fig.1 Forward Current vs. Ambient Temperature

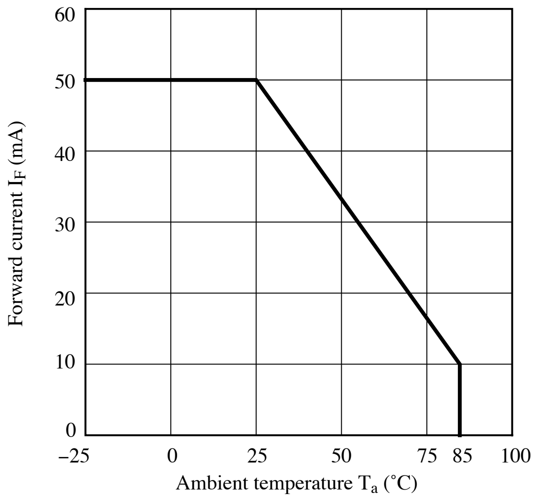


Fig.2 Output Power Dissipation vs. Ambient Temperature

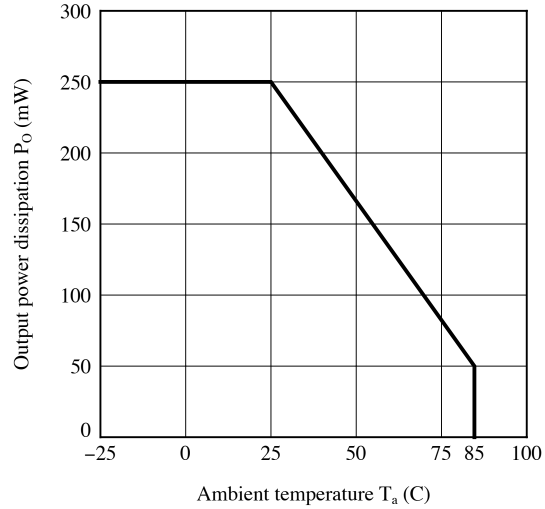


Fig.3 Low Level Output Current vs. Ambient Temperature

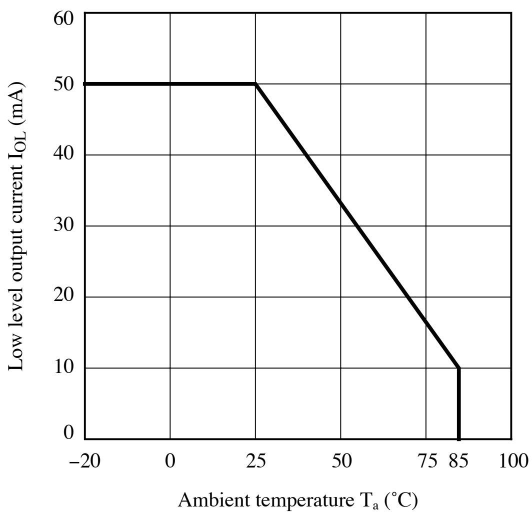


Fig.4 Forward Current vs. Forward Voltage

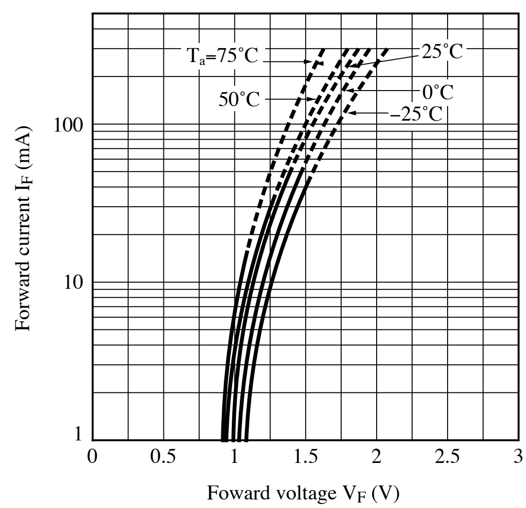


Fig.5 Relative Threshold Input Current vs. Supply Voltage

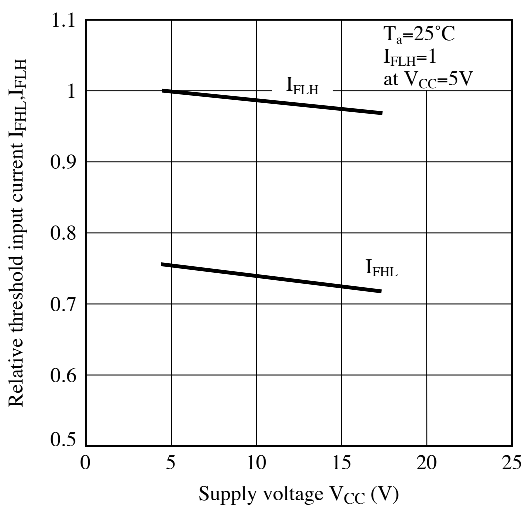


Fig.6 Relative Threshold Input Current vs. Ambient Temperature

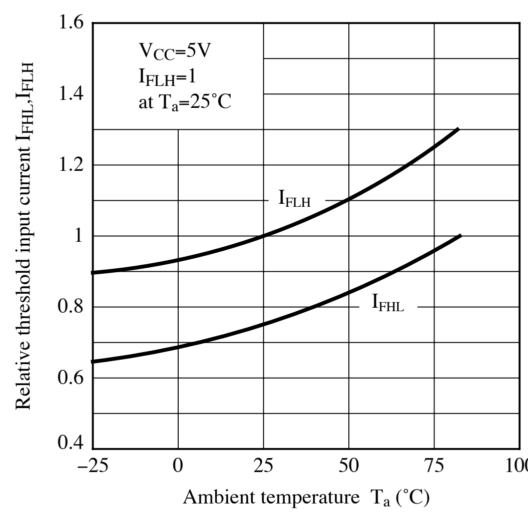


Fig.7 Low Level Output Voltage vs. Low Level Output Current

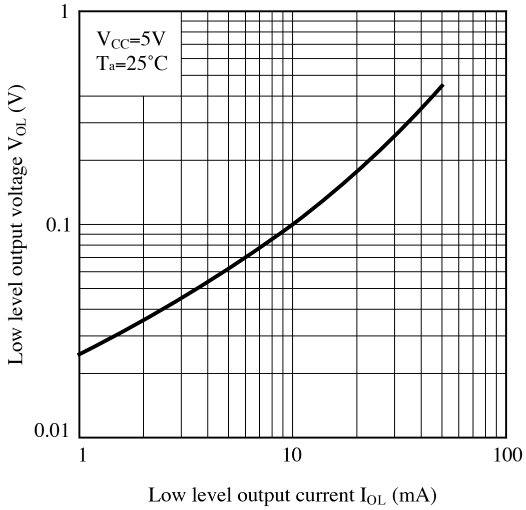


Fig.8 Low Level Output Voltage vs. Ambient Temperature

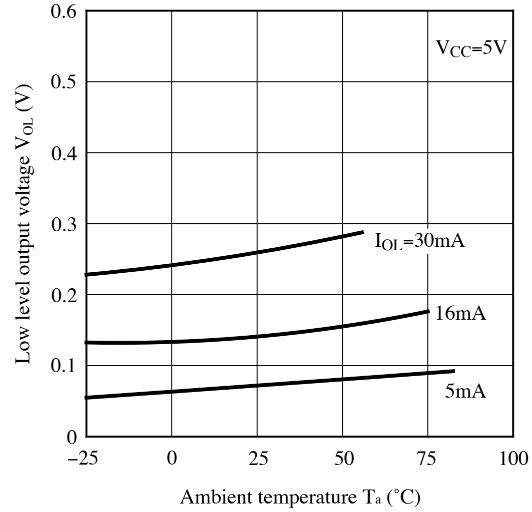


Fig.9 Supply Current vs. Ambient Temperature

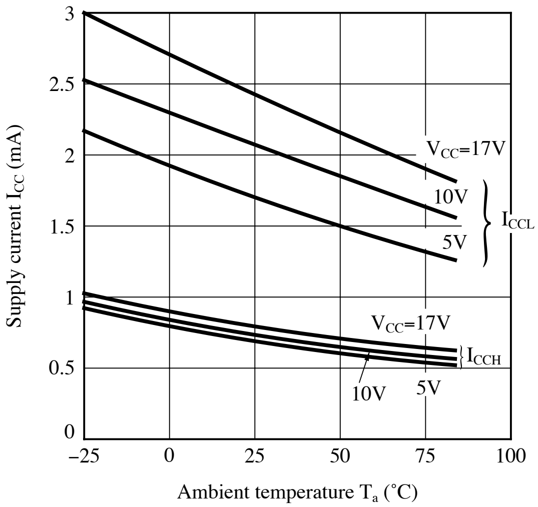


Fig.10 Propagation Delay Time vs. Forward Current

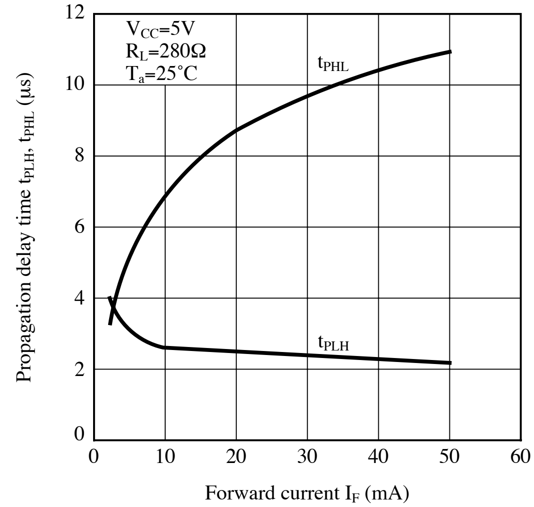


Fig.11 Rise Time,Fall Time vs. Load Resistance

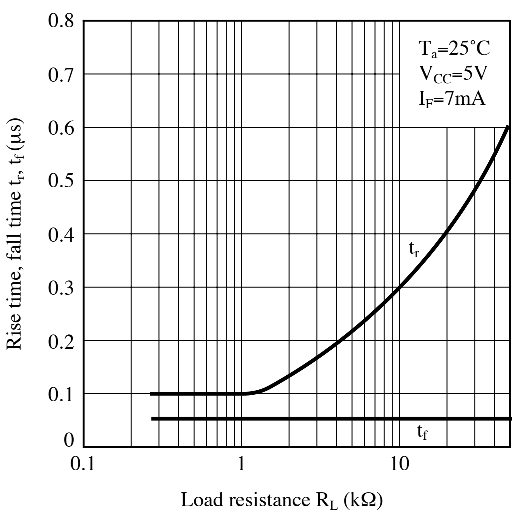
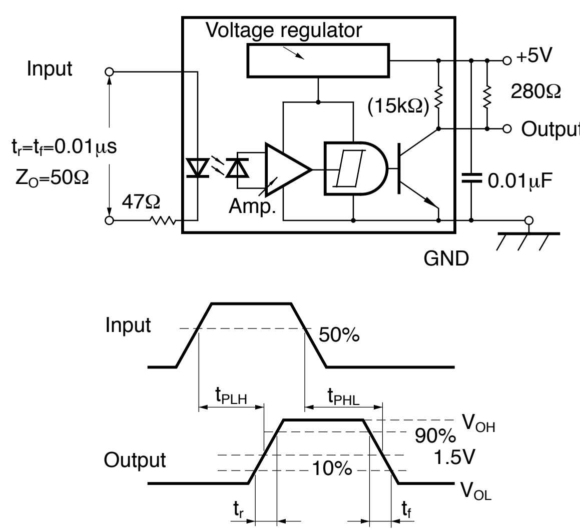


Fig.12 Test Circuit for Response Time



Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

■Design Considerations

● Recommended operating conditions

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Output current	I_O	–	–	16	mA
Forward current	I_F	10	–	20	mA
Operating terperature	T_{opr}	0	–	70	˚C

● Notes about static electricity

Transisiter of detector side in bipolar configuration may be damaged by static electricity due to its minute design.

When handing these devices, general countermeasure against static electricity should be taken to avoid breakdown of devices or degradation of characteristics.

● Design guide

1) Prevention of detection error

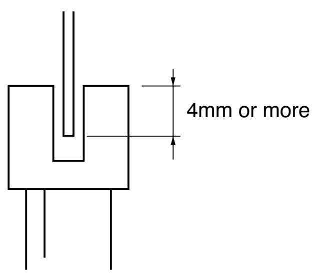
To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

2) In order to stabilize power supply line, connect a by-pass capacitor of more than 0.01μF between V_{CC} and GND near the device.

3) Position of opaque board

Opaque board shall be installed at place 4mm or more from the top of elements.

(Example)



This product is not designed against irradiation and incorporates non-coherent IRED.

● Degradation

In general, the emission of the IRED used in photocouplers will degrade over time.

In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

● Parts

This product is assembled using the below parts.

• Photodetector (qty. : 1) [Using a silicon photodiode as light detecting portion, and a bipolar IC as signal processing circuit]

Category	Maximum Sensitivity wavelength (nm)	Sensitivity wavelength (nm)	Response time (μs)
Photodiode	900	400 to 1 200	3

• Photo emitter (qty. : 1)

Category	Material	Maximum light emitting wavelength (nm)	I/O Frequency (MHz)
Infrared emitting diode (non-coherent)	Gallium arsenide (GaAs)	950	0.3

• Material

Case	Lead frame plating
Black NORYL resin	Solder dip. (Sn–3Ag–0.5Cu)

• Others

Laser generator is not used.

■ Manufacturing Guidelines

● Soldering Method

Flow Soldering:

Soldering should be completed below 260˚C and within 5 s.
Please take care not to let any external force exert on lead pins.
Please don't do soldering with preheating, and please don't do soldering by reflow.

Hand soldering

Hand soldering should be completed within 3 s when the point of solder iron is below 350˚C.
Please solder within one time.
Please don't touch the terminals directly by soldering iron.
Soldered product shall treat at normal temperature.

Other notice

Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the cooling and soldering conditions.

Flux

Some flux, which is used in soldering, may crack the package due to synergistic effect of alcohol in flux and the rise in temperature by heat in soldering. Therefore, in using flux, please make sure that it does not have any influence on appearance and reliability of the photointerrupter.

● Cleaning instructions

Solvent cleaning :

Solvent temperature should be 45˚C or below. Immersion time should be 3 minutes 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.

Recommended solvent materials :

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol.

● Presence of ODC

This product shall not contain the following materials.
And they are not used in the production process for this product.
Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).

■ Package specification

● Case package

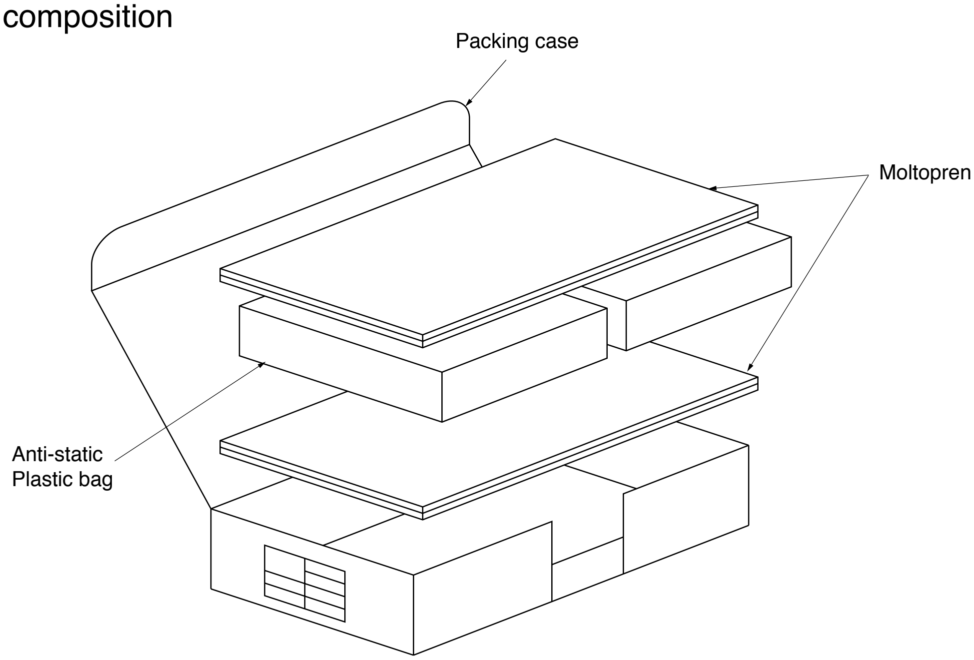
Package materials

Anti-static plastic bag : Polyethtylene
Moltopren : Urethane
Packing case : Corrugated fiberboard

Package method

50 pcs of products shall be packaged in a plastic bag, Ends shall be fixed by stoppers. The bottom ot the packing case is covered with moltopren, and 2 plastic bags shall be put int the packing case.
Moltopren should be located after all product are settled (1 packing contains 100 pcs).

Packing composition



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--- Personal computers
--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:

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--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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--- Telecommunication equipment [trunk lines]
--- Nuclear power control equipment
--- Medical and other life support equipment (e.g., scuba).

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