PC901V0NSZXF Series

Digital Output, Normal ON Operation DIP 6 pin *OPIC Photocoupler

■ Description

PC901V0NSZXF Series contains an IRED optically coupled to an OPIC chip.

It is packaged in a 6 pin DIP.

Input-output isolation voltage(rms) is 5.0kV.

■ Features

1. 6 pin DIP package
2. Double transfer mold package (Ideal for Flow Soldering)
3. Normal ON operation, open collector output
4. TTL and LSTTL compatible output
5. Operating supply voltage (V_{CC}=3 to 15 V)
6. Isolation voltage ($V_{iso(rms)}$: 5.0 kV)
7. Lead-free and RoHS directive compliant

■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC901V**)
2. Approved by VDE, DIN EN60747-5-2(*) (as an option), file No. 40008189 (as model No. **PC901V**)
3. Package resin : UL flammability grade (94V-0)

(*)DIN EN60747-5-2 : successor standard of DIN VDE0884

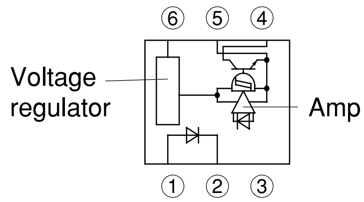
■ Applications

1. Programmable controllers
2. PC peripherals
3. Electronic musical instruments

* "OPIC"(Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and a signal-processing circuit integrated onto a single chip.

Sheet No.: D2-A05402EN
Date Jun. 30. 2005

■ Internal Connection Diagram

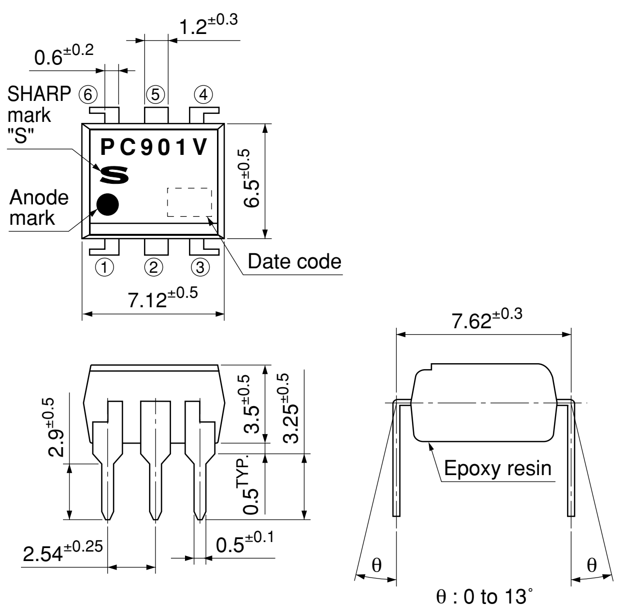


① Anode
② Cathode
③ NC
④ V_O
⑤ GND
⑥ V_{CC}

■ Outline Dimensions

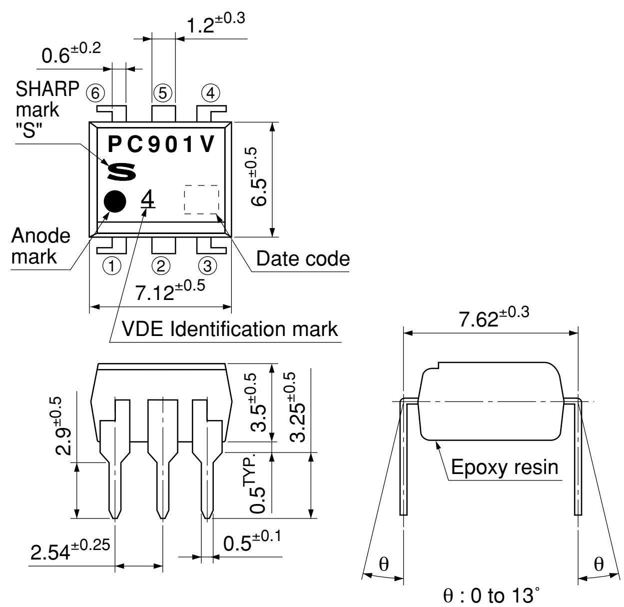
(Unit : mm)

1. Through-Hole [ex. **PC901V0NSZXF**]



Product mass : approx. 0.36g

2. Through-Hole (VDE option) [ex. **PC901V0YSZXF**]



Product mass : approx. 0.36g

Plating material : SnCu (Cu : TYP. 2%)

Date code (2 digit)

1st digit				2nd digit	
Year of production				Month of production	
A.D.	Mark	A.D	Mark	Month	Mark
1990	A	2002	P	January	1
1991	B	2003	R	February	2
1992	C	2004	S	March	3
1993	D	2005	T	April	4
1994	E	2006	U	May	5
1995	F	2007	V	June	6
1996	H	2008	W	July	7
1997	J	2009	X	August	8
1998	K	2010	A	September	9
1999	L	2011	B	October	O
2000	M	2012	C	November	N
2001	N	⋮	⋮	December	D

repeats in a 20 year cycle

Country of origin

Japan

Rank mark

There is no rank mark indicator.

■ Absolute Maximum Ratings

(T_a=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Supply voltage	V_{CC}	16	V
	High level output voltage	V_{OH}	16	V
	Low level output current	I_{OL}	50	mA
	Power dissipation	P_O	150	mW
Total power dissipation		P_{tot}	170	mW
Operating temperature		T_{opr}	−25 to +85	°C
Storage temperature		T_{stg}	−40 to +125	°C
*2 Isolation voltage		$V_{iso\ (rms)}$	5.0	kV
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width≤100μs, Duty ratio:0.001
*2 40 to 60%RH, AC for 1minute, f=60Hz
*3 For 10s

■ Electro-optical Characteristics

(unless otherwise specified T_a=0 to +70˚C)

Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=4mA	−	1.1	1.4	V
				I_F=0.3mA	0.7	1.0	−	
	Reverse current		I_R	T_a=25˚C, V_R=4V	−	−	10	μA
	Terminal capacitance		C_t	T_a=25˚C, V=0, f=1kHz	−	30	250	pF
Output	Operating supply voltage		V_{CC}	−	3	−	15	V
	Low level output voltage		V_{OL}	I_{OL}=16mA, V_{CC}=5V, I_F=0	−	0.2	0.4	V
	High level output current		I_{OH}	V_O=V_{CC}=15V, I_F=4mA	−	−	100	μA
	Low level supply current		I_{CCL}	V_{CC}=5V, I_F=0	−	2.5	5.0	mA
	High level supply current		I_{CCH}	V_{CC}=5V, I_F=4mA	−	2.7	5.5	mA
	*4 "Low→High" input threshold current		I_{FLH}	T_a=25˚C, V_{CC}=5V, R_L=280Ω	−	1.1	2.0	mA
				V_{CC}=5V, R_L=280Ω	−	−	4.0	
	*5 "High→Low" input threshold current		I_{FHL}	T_a=25˚C, V_{CC}=5V, R_L=280Ω	0.4	0.8	−	mA
				V_{CC}=5V, R_L=280Ω	0.3	−	−	
	*6 Hysteresis		I_{FHL}/I_{FLH}	V_{CC}=5V, R_L=280Ω	0.5	0.7	0.9	−
	Isolation voltage		R_{ISO}	T_a=25˚C, DC500V, 40 to 60%RH	5×10^{10}	1×10^{11}	−	Ω
Transfer charac-teristics	Response time	"Low→High" propagation delay time	t_{PLH}	T_a=25˚C, V_{CC}=5V, I_F=4mA, R_L=280Ω	−	1	3	μs
		"High→Low" propagation delay time	t_{PHL}		−	2	6	
		Rise time	t_r		−	0.1	0.5	
		Fall time	t_f		−	0.05	0.5	
	Instantaneous common mode rejection voltage "Output : High level"		CM_H	V_{CM}=600V(peak), V_O(MIN.)=2V, I_F=4mA, R_L=280Ω, T_a=25˚C	−	−2 000	−	V/μs
	Instantaneous common mode rejection voltage "Output : Low level"		CM_L	V_{CM}=600V(peak), V_O(MAX.)=0.8V, I_F=0, R_L=280Ω, T_a=25˚C	−	2 000	−	V/μs

*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 Hysteresis stands for I_{FHL}/I_{FLH}.

■ Model Line-up

Lead Form	Through-Hole	
Package	Sleeve	
	50 pcs/sleeve	
DIN EN60747-5-2	———	Approved
Model No.	**PC901V0NSZXF**	**PC901V0YSZXF**

Please contact a local SHARP sales representative to inquire about production status.

Fig.1 Test Circuit for Response Time

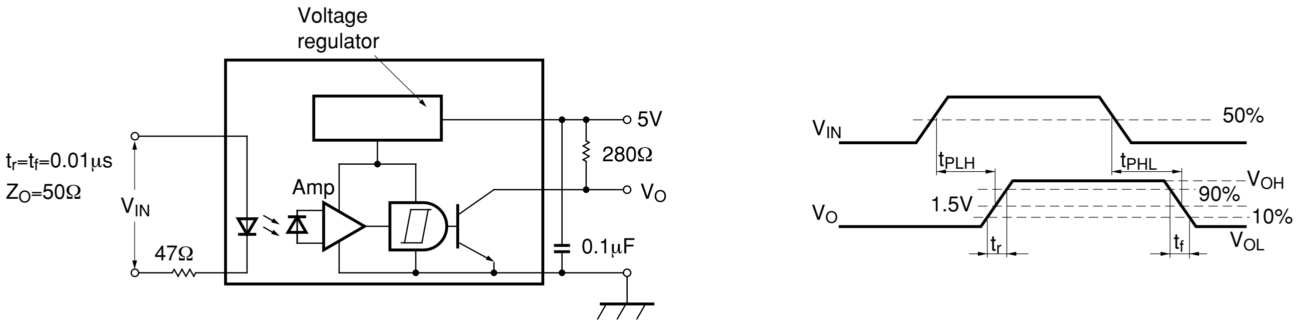


Fig.2 Test Circuit for Instantaneous Common Mode Rejection Voltage

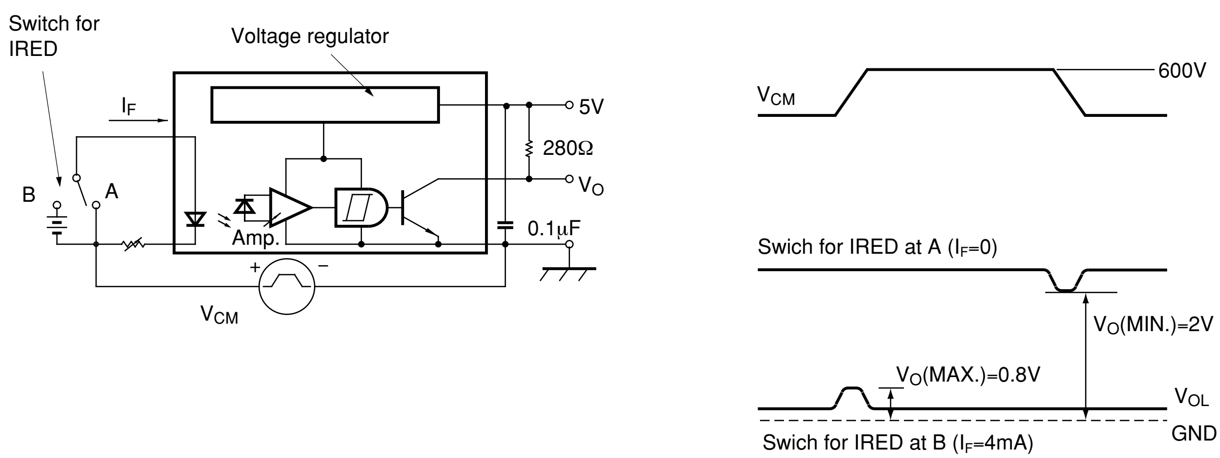


Fig.3 Forward Current vs. Ambient Temperature

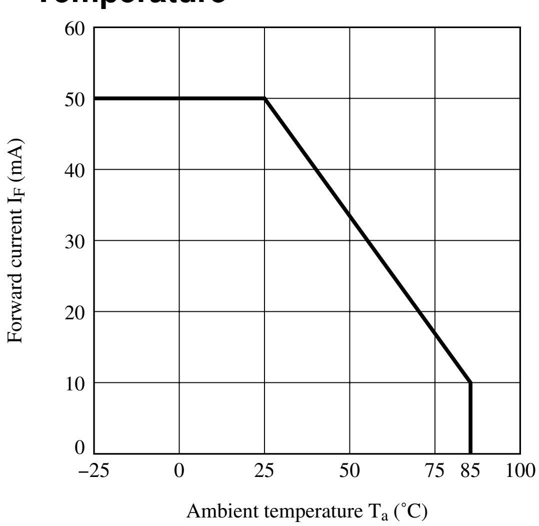


Fig.4 Power Dissipation vs. Ambient Temperature

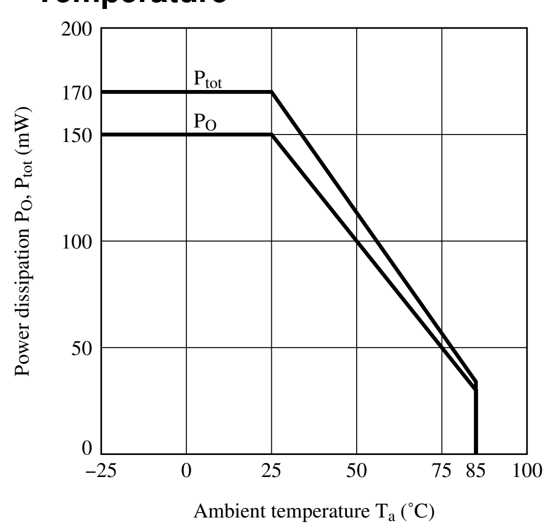


Fig.5 Forward Current vs. Forward Voltage

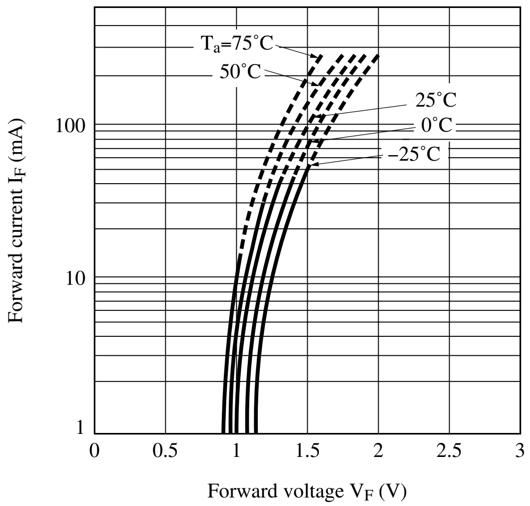


Fig.6 Relative Input Threshold Current vs. Supply Voltage

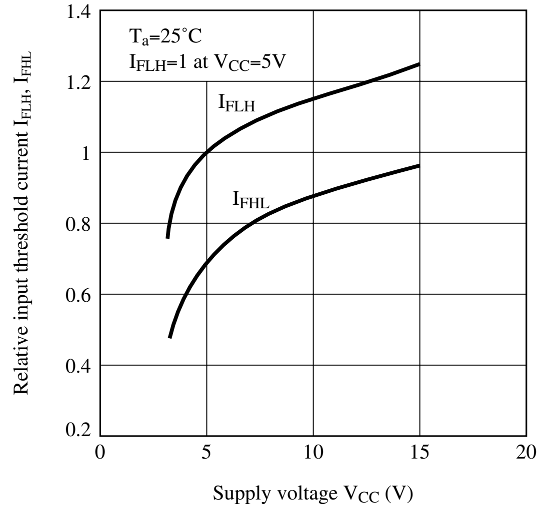


Fig.7 Relative Input Threshold Current vs. Ambient Temperature

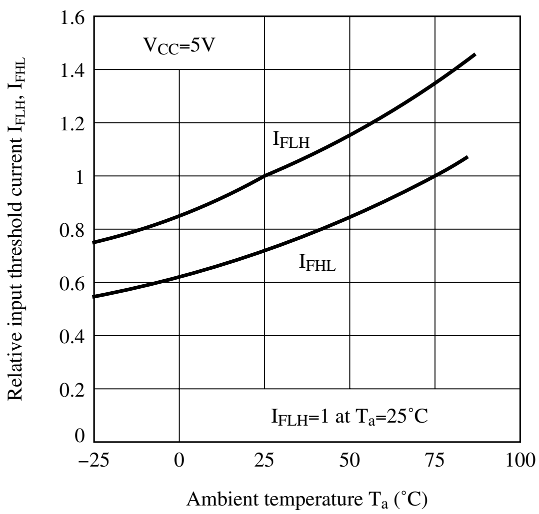


Fig.8 Low Level Output Voltage vs. Low Level Output Current

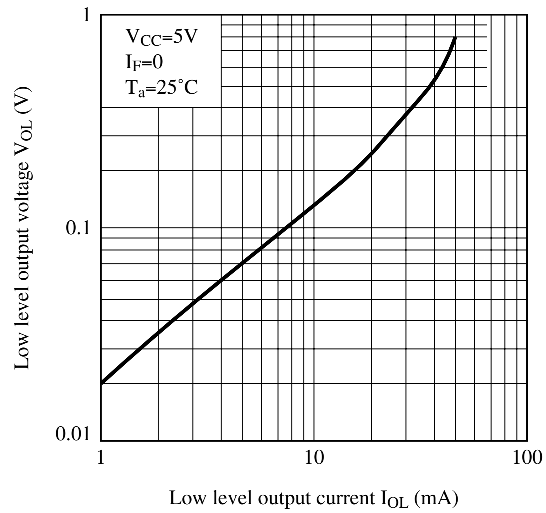


Fig.9 Low Level Output Voltage vs. Ambient Temperature

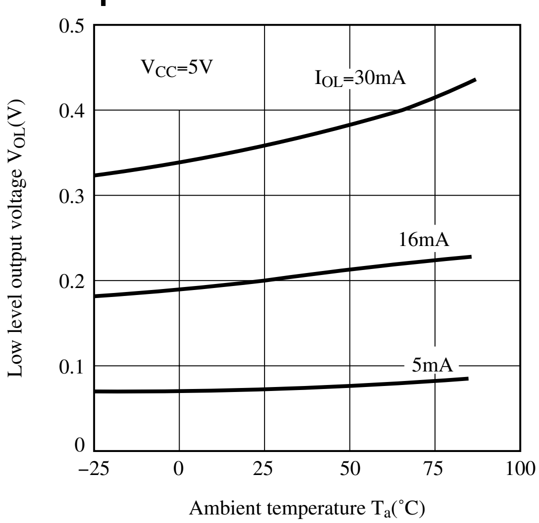


Fig.10 High Level Output Current vs. Forward Current

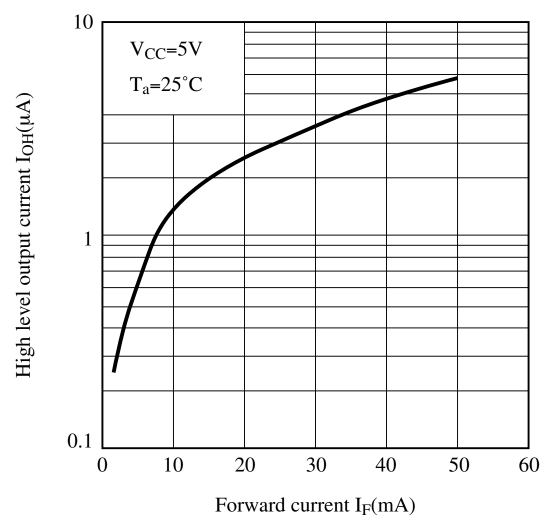


Fig.11 High Level Output Current vs. Ambient Temperature

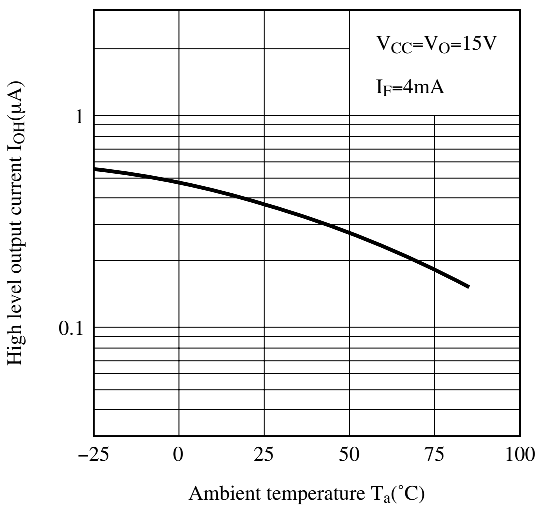


Fig.12 Supply Current vs. Supply Voltage

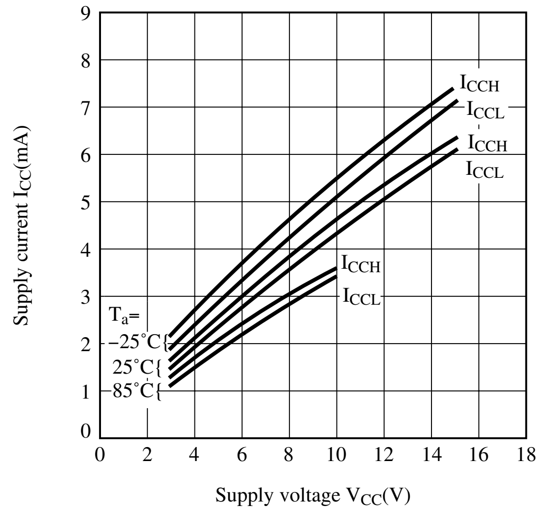


Fig.13 Propagation Delay Time vs. Forward Current

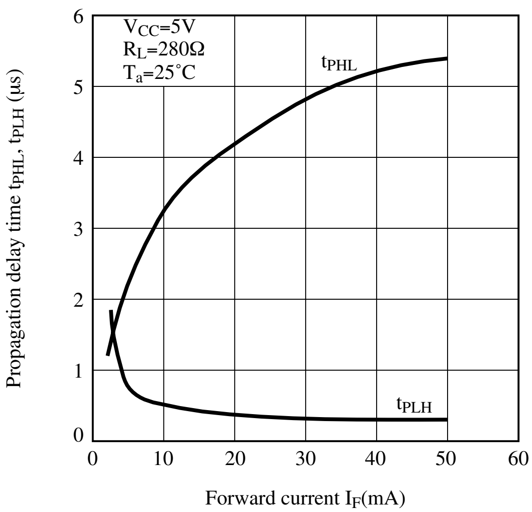
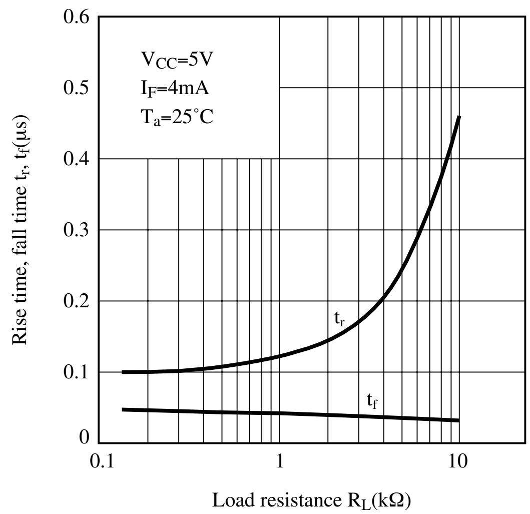


Fig.14 Rise Time, Fall Time vs. Load Resistance



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

■ Design Considerations

● Notes about static electricity

Transistor of detector side in bipolar configuration may be damaged by static electricity due to its minute design.
When handling these devices, general countermeasure against static electricity should be taken to avoid breakdown of devices or degradation of characteristics.

● Design guide

In order to stabilize power supply line, we should certainly recommend to connect a by-pass capacitor of 0.01μF or more between V_{CC} and GND near the device.

In case that some sudden big noise caused by voltage variation is provided between primary and secondary terminals of photocoupler some current caused by it is floating capacitance may be generated and result in false operation since current may go through IRED or current may change.
If the photocoupler may be used under the circumstances where noise will be generated we recommend to use the bypass capacitors at the both ends of IRED.

The detector which is used in this device, has parasitic diode between each pins and GND.
There are cases that miss operation or destruction possibly may be occurred if electric potential of any pin becomes below GND level even for instant.
Therefore it shall be recommended to design the circuit that electric potential of any pin does not become below GND level.

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.
Please decide the input current which become 2 times of MAX. I_{FLH}.

☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

■ Manufacturing Guidelines

● Soldering Method

Flow Soldering :

Due to SHARP's double transfer mold construction submersion in flow solder bath is allowed under the below listed guidelines.

Flow soldering should be completed below 270˚C and within 10s.
Preheating is within the bounds of 100 to 150˚C and 30 to 80s.
Please don't solder more than twice.

Hand soldering

Hand soldering should be completed within 3s when the point of solder iron is below 400˚C.
Please don't solder more than twice.

Other notices

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 tooling and soldering conditions.

● Cleaning instructions

Solvent cleaning:

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

Ultrasonic cleaning:

The impact on the device varies depending on the size of the cleaning bath, ultrasonic output, cleaning time, size of PCB and mounting method of the device.
Therefore, please make sure the device withstands the ultrasonic cleaning in actual conditions in advance of mass production.

Recommended solvent materials:

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol
In case the other type of solvent materials are intended to be used, please make sure they work fine in actual using conditions since some materials may erode the packaging resin.

● 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

● Sleeve package

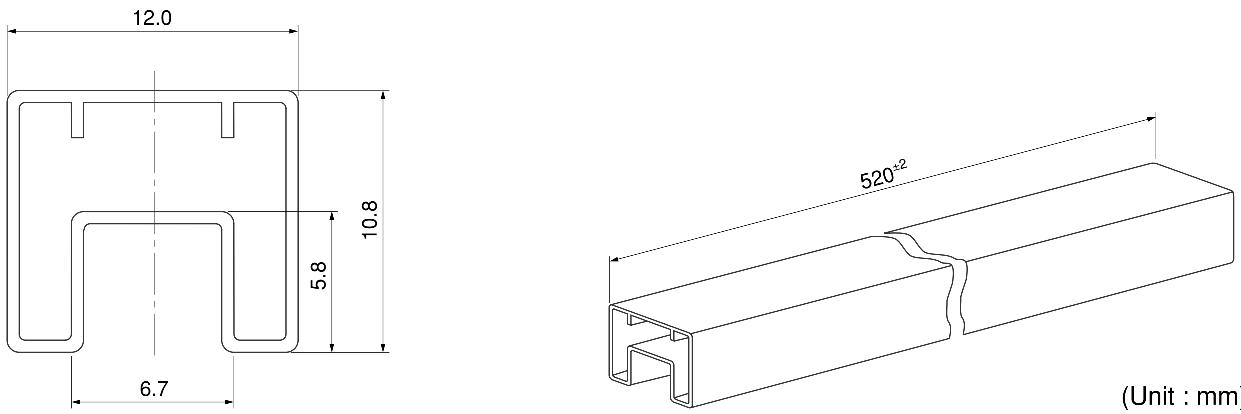
Package materials

Sleeve : HIPS (with anti-static material)
Stopper : Styrene-Elastomer

Package method

MAX. 50 pcs. of products shall be packaged in a sleeve.
Both ends shall be closed by tabbed and tabless stoppers.
The product shall be arranged in the sleeve with its anode mark on the tabless stopper side.
MAX. 20 sleeves in one case.

Sleeve outline dimensions



(Unit : mm)

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· The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.

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(i) The devices in this publication are designed for use in general electronic equipment designs such as:

--- 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:

--- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

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

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