PC3H71xNIP1H Series

Mini-flat Half Pitch Package High CMR, Low Input Current Photocoupler

■ Description

PC3H71xNIP1H Series contains a IRED optically coupled to a phototransistor.

It is packaged in a 4-pin mini-flat, half pitch type.

Input-output isolation voltage(rms) is 2.5kV.

Collector-emitter voltage is 80V, CTR is 100% to 700%(at I_F=0.5mA,V_{CE}=5V,Ta=25℃) and CMR is MIN.10kV/μs.

■ Features

1. 4-pin Mini-flat Half pitch package (Lead pitch : 1.27mm)
2. Double transfer mold package (Ideal for Flow Soldering)
3. Low input current type (I_F=0.5mA)
4. High collector-emitter voltage (V_{CEO} : 80V)
5. High noise immunity due to high common mode rejection voltage (CMR : MIN. 10kV/μs)
6. Isolation voltage between input and output ($V_{iso(rms)}$: 2.5kV)
7. RoHS directive compliant

■ Agency approvals/Compliance

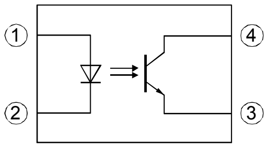
1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC3H71**)
2. Package resin : UL flammability grade (94V-0)

■ Applications

1. Programmable controllers
2. Facsimiles
3. Telephones

Sheet No.: OP18011EN
Date Jan. 15. 2018

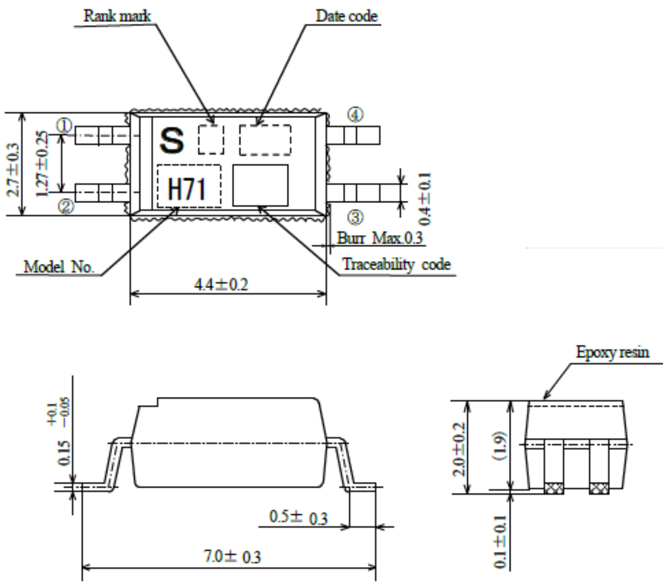
■Internal Connection Diagram



① Anode
② Cathode
③ Emitter
④ Collector

■Outline Dimensions

(Unit : mm)



*( ): Reference dimensions

Product mass : approx. 0.05g

Date code indication (Ex.)

3-digit number shall be marked the age indication of 1-digit number, and week code of 2-digit number.
Week code “01” indicate the week including the first Thursday of January. And later, Monday is the starting point.

Year	Week

Date code	MON	TUE	WED	THU	FRI	SAT	SUN
652	12/26	12/27	12/28	12/29	12/30	12/31	1/1
701	1/2	1/3	1/4	1/5	1/6	1/7	1/8
702	1/9	1/10	1/11	1/12	1/13	1/14	1/15
703	1/16	1/17	1/18	1/19	1/20	1/21	1/22
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
752	12/11	12/12	12/13	12/14	12/15	12/16	12/17
751	12/18	12/19	12/20	12/21	12/22	12/23	12/24
752	12/25	12/26	12/27	12/28	12/29	12/30	12/31
801	1/1	1/2	1/3	1/4	1/5	1/6	1/7

Country of origin and Plating material

Country of origin	Plating material
Japan	SnBi (Bi : 1～4%)

Rank mark

Refer to the Model Line-up table.

■Absolute Maximum Ratings

(T_a=25˚C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	10	mA
	*1 Peak forward current	I_{FM}	200	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P	15	mW
Output	Collector-emitter voltage	V_{CEO}	80	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	170	mW
Operating temperature		T_{opr}	−30 to +100	˚C
Storage temperature		T_{stg}	−40 to +125	˚C
*2 Isolation voltage		$V_{iso\,(rms)}$	2.5	kV
*3 Soldering temperature		T_{sol}	260	˚C

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

■Electro-optical Characteristics

(T_a=25˚C)

	Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=5mA	–	1.2	1.4	V
	Reverse current		I_R	V_R=4V	–	–	10	μA
	Terminal capacitance		C_t	V=0, f=1kHz	–	30	250	pF
Output	Dark current		I_{CEO}	V_{CE}=50V, I_F=0	–	–	100	nA
	Collector-emitter breakdown voltage		BV_{CEO}	I_C=0.1mA, I_F=0	80	–	–	V
	Emitter-collector breakdown voltage		BV_{ECO}	I_E=10μA, I_F=0	6	–	–	V
Transfer charac-teristics	Collector current		I_C	I_F=0.5mA, V_{CE}=5V	0.5	–	3.5	mA
	Collector-emitter saturation voltage		$V_{CE\,(sat)}$	I_F=10mA, I_C=1mA	–	–	0.2	V
	Isolation resistance		R_{ISO}	DC500V, 40 to 60%RH	5×10^{10}	1×10^{11}	–	Ω
	Floating capacitance		C_f	V=0, f=1MHz	–	0.6	1.0	pF
	Response time	Rise time	t_r	V_{CE}=2V, I_C=2mA, R_L=100Ω	–	4	18	μs
		Fall time	t_f		–	3	18	μs
	Common mode rejection ratio		CMR	T_a=25˚C, R_L=470Ω, V_{CM}=1.5kV(peak) I_F=0, V_{CC}=9V, V_{np}=100mV	10	–	–	kV/μs

■ Model Line-up

Package	Taping 3,500pcs/reel	Rank mark	I_C [mA] (I_F=0.5mA, V_{CE}=5V, T_a=25˚C)
Model No.	**PC3H710NIP1H**	with or "_"	0.5 to 3.5
	PC3H711NIP1H	A	0.7 to 1.75
	PC3H712NIP1H	B	1.0 to 2.5

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

Fig.1 Forward Current vs. Ambient Temperature

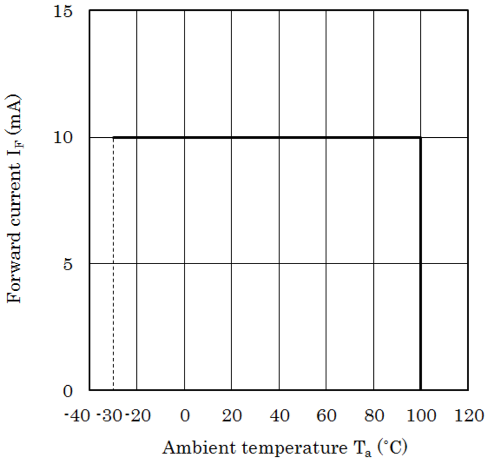


Fig.2 Diode Power Dissipation vs. Ambient Temperature

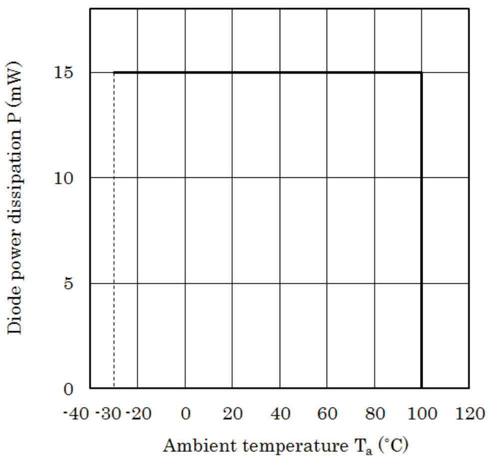


Fig.3 Collector Power Dissipation vs. Ambient Temperature

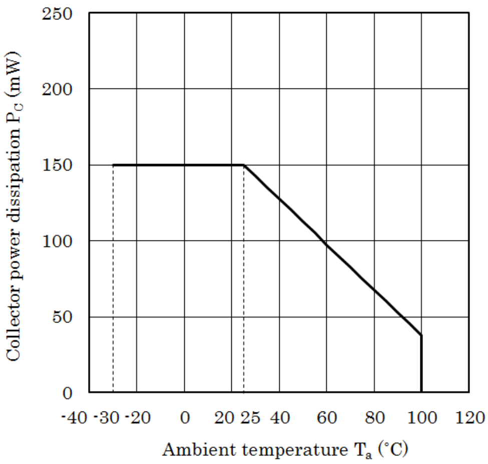


Fig.4 Total Power Dissipation vs. Ambient Temperature

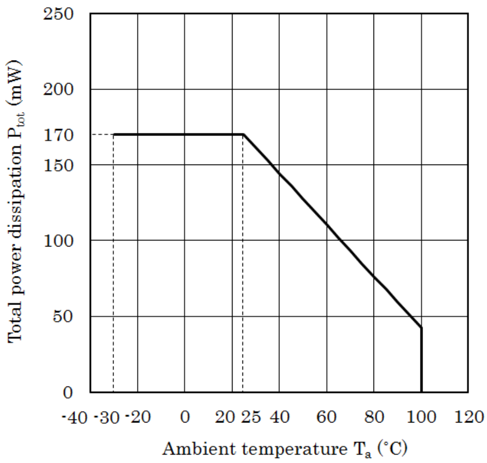


Fig.5 Peak Forward Current vs. Duty Ratio

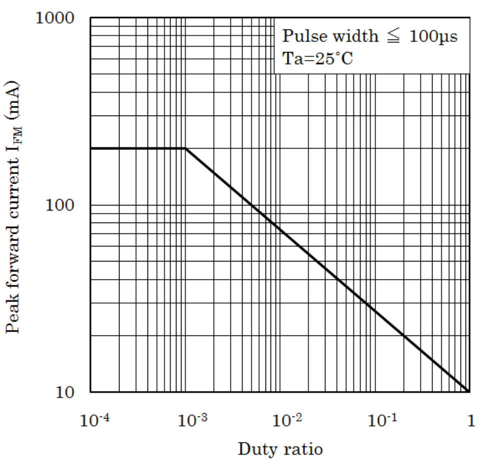


Fig.6 Forward Current vs. Forward Voltage

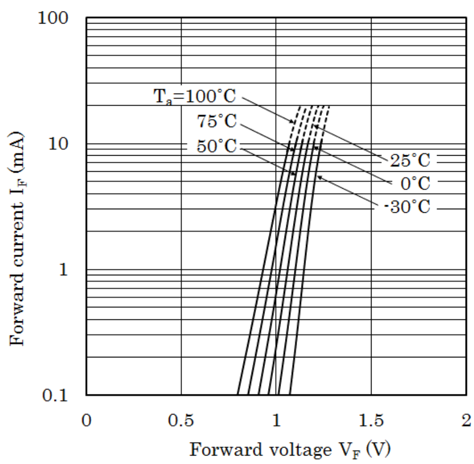


Fig.7 Current Transfer Ratio vs. Forward Current

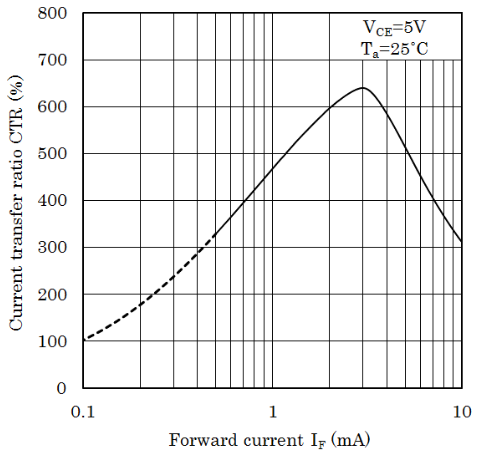


Fig.8 Collector Current vs. Collector-emitter Voltage

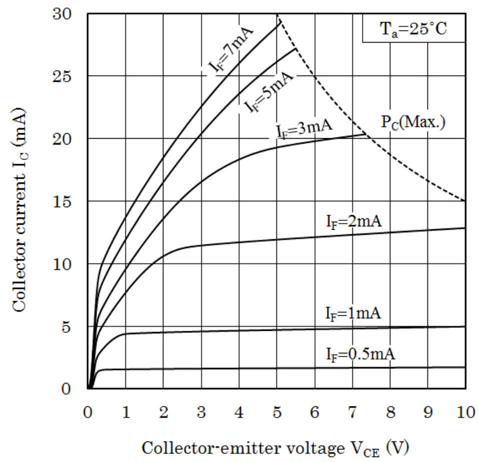


Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature

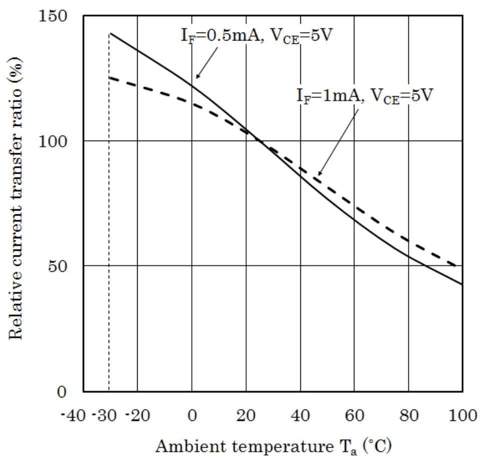


Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature

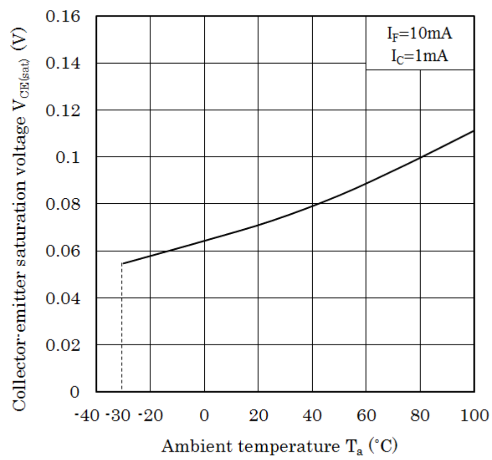


Fig.11 Collector Dark Current vs. Ambient Temperature

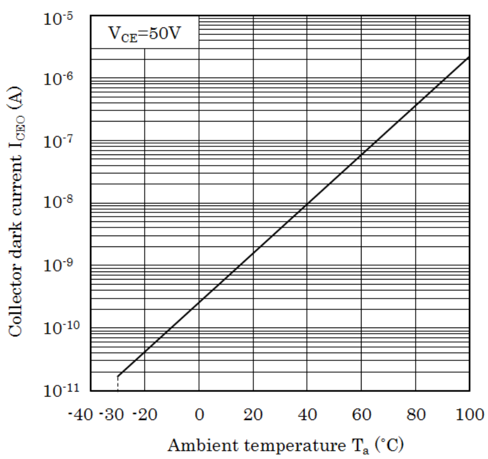


Fig.12 Collector-emitter Saturation Voltage vs. Forward Current

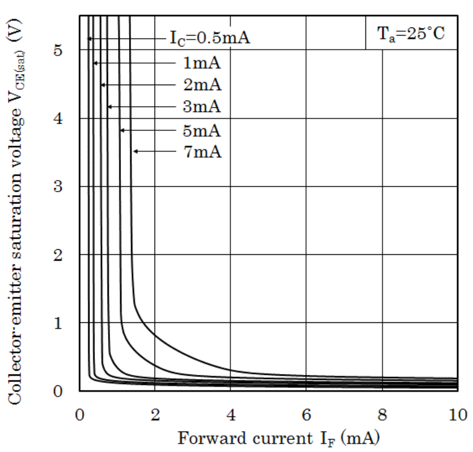


Fig.13 Response Time vs. Load Resistance (Saturation region)

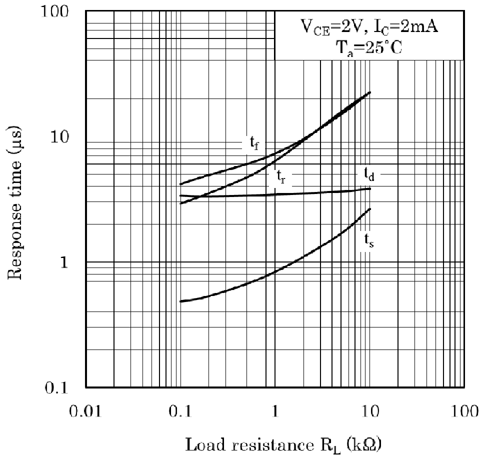


Fig.14 Test Circuit for Response Time

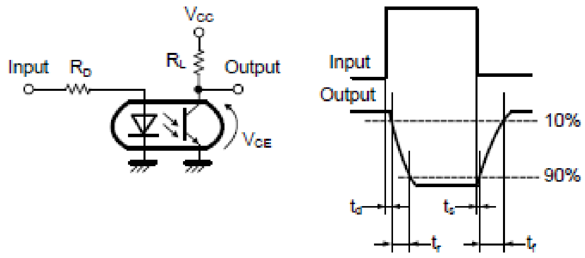


Fig.15 Frequency Response

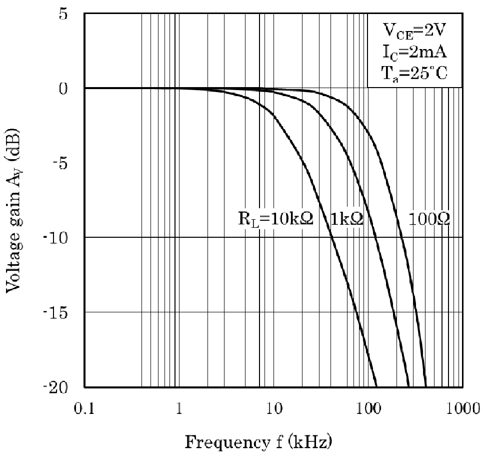


Fig.16 Test Circuit for Frequency Response

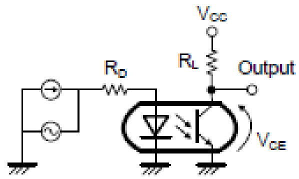
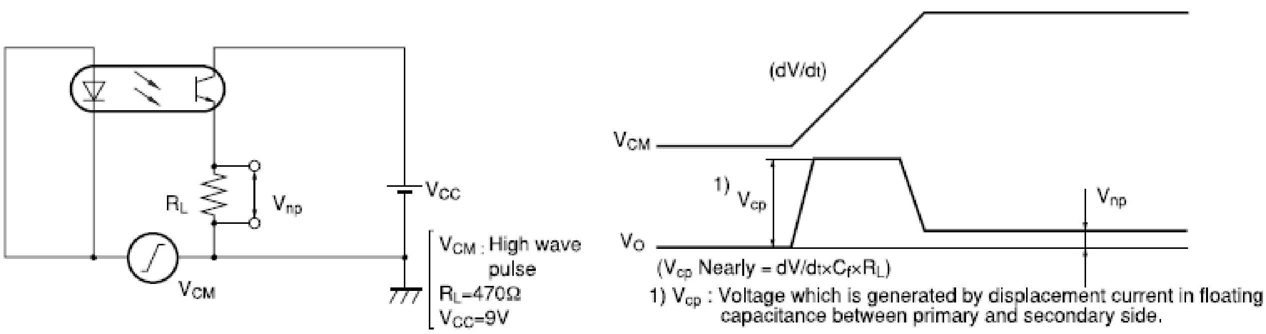


Fig.17 Test Circuit for Common Mode Rejection Voltage



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

■ Design Considerations

● Design guide

While operating at I_F<0.5mA, CTR variation may increase.
Please make design considering this fact.

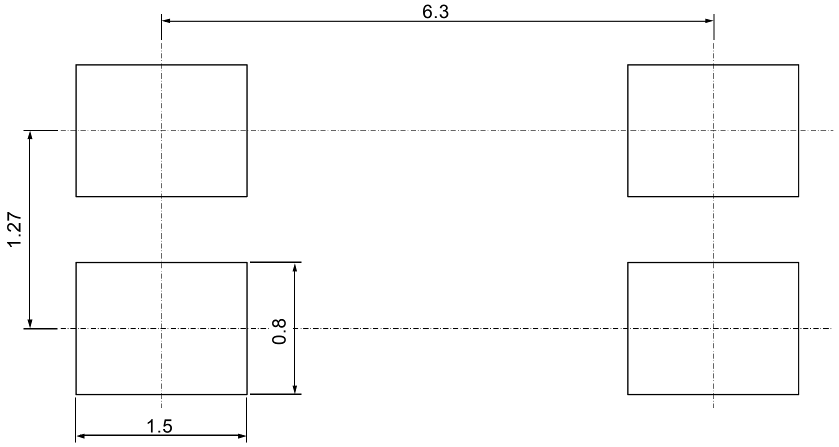
In case that some sudden big noise caused by voltage variation is provided between primary and secondary terminals of photocoupler some current caused by it is floating capacitance may be generated and result in false operation since current may go through IRED or current may change.
If the photocoupler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

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.

● Recommended Foot Print (reference)



(Unit : mm)

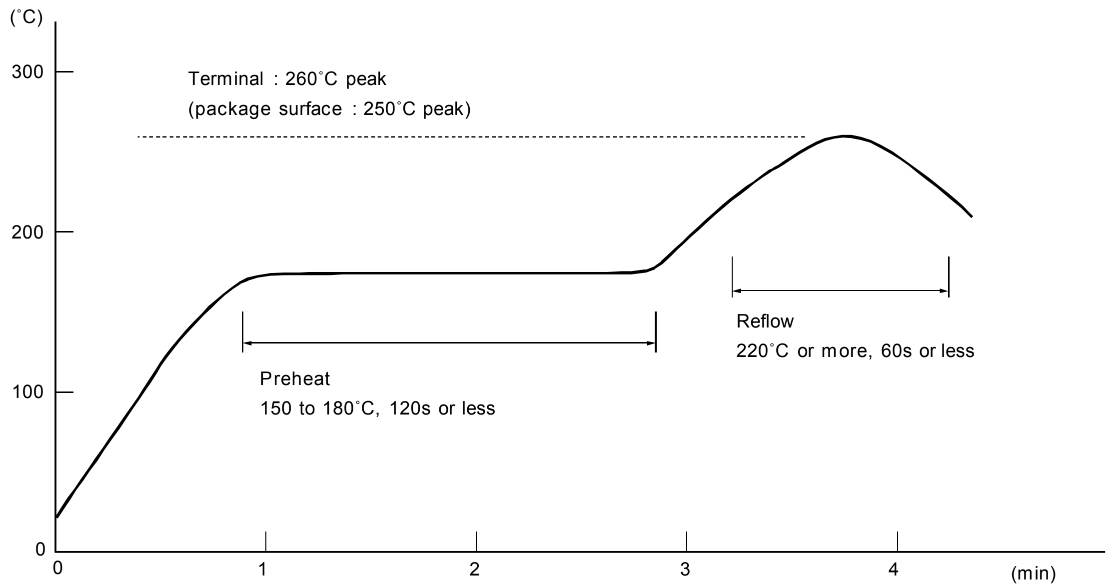
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

■ Manufacturing Guidelines

● Soldering Method

Reflow Soldering :

Reflow soldering should follow the temperature profile shown below.
Soldering should not exceed the curve of temperature profile and time.
Please don't solder more than twice.



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℃ and within 10s.
Preheating is within the bounds of 100 to 150℃ 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℃.
Please don't solder more than twice.

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 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 PBB and PBDE are not used in this product at all.

(1) The RoHS directive(2011/65/EU)
This product complies with the RoHS directive(2011/65/EU)
Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

(2) Content of six substances specified in Management Methods 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).

Marking Styles for the Names and Contents of the Hazardous Substances

Category	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr^{6+})	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Photocoupler	○	○	○	○	○	○

This table is prepared in accordance with the provisions of SJ/T 11364.
○ : Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

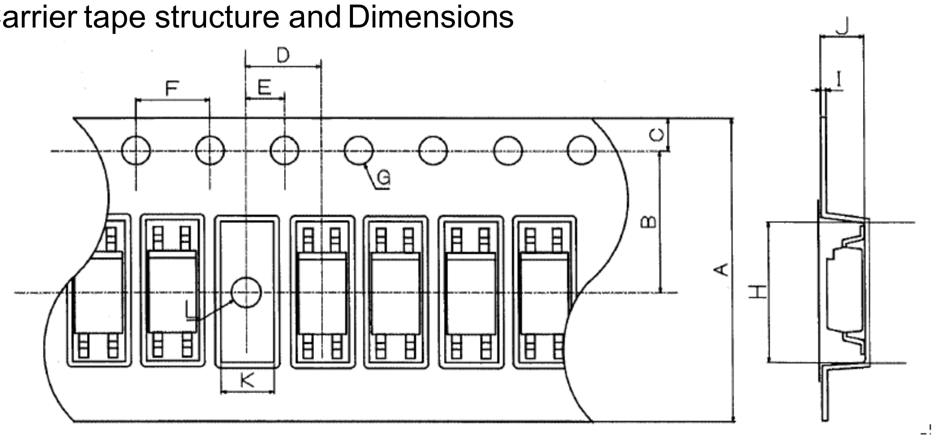
■ Package specification

● Tape and Reel package

Package materials

Carrier tape : PS
Cover tape : PET (three layer system)
Reel : PS

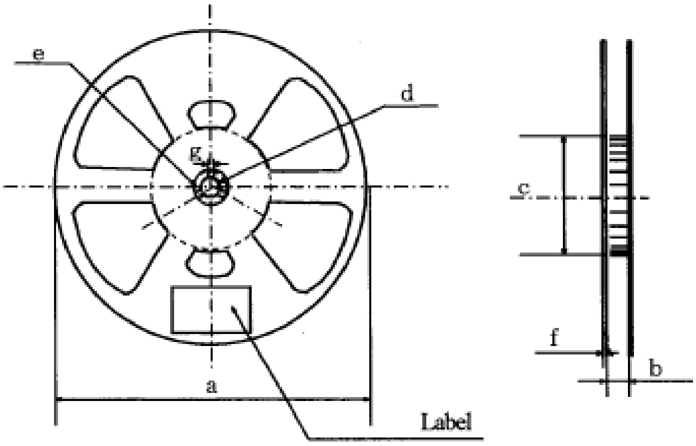
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
$16.0^{\pm0.3}$	$7.5^{\pm0.1}$	$1.75^{\pm0.1}$	$4.0^{\pm0.1}$	$2.0^{\pm0.1}$	$4.0^{\pm0.1}$	$\phi1.5^{+0.1}_{-0.0}$
H	I	J	K	L		
$7.55^{\pm0.1}$	0.3	$2.3^{\pm0.1}$	$2.85^{\pm0.1}$	$\phi1.55^{\pm0.1}$		

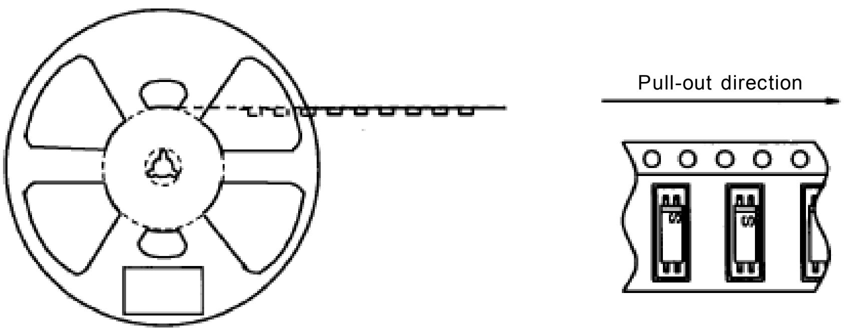
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
$\phi330\pm2.0$	$17.5^{\pm1.0}$	$\phi100.0^{\pm1.0}$	$\phi13.0^{\pm0.2}$
e	f	g	
$\phi21.0^{\pm0.8}$	$2.0^{\pm0.5}$	$2.0^{\pm0.5}$	

Direction of product insertion



[Packing : 3,500pcs/reel]

■ Important Notices

·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.

·Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.

·Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(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).

·If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

·Contact and consult with a SHARP representative if there are any questions about the contents of this publication.