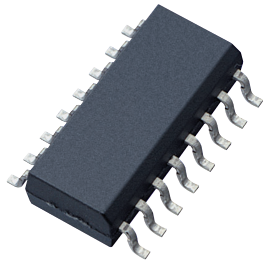
PC3Q410NIP

*1-channel package type is also available.
(model No. **PC3H41xNIP Series**)

Mini-flat Half Pitch 4-channel Package, High CMR, AC Input, Low Input Current Photocoupler



■ Description

PC3Q410NIP contains a IRED optically coupled to a phototransistor.

It is packaged in a 4 channel Mini-flat, half pitch type.

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

Collector-emitter Voltage is 80V(*) ,CTR is 50% to 400% at input current of ±0.5mA and CMR is MIN. 10kV/μs.

■ Features

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

(*) Up to Date code "P9" (September 2002) V_{CEO} : 70V.

■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC3Q41**)
2. Package resin : UL flammability grade (94V-0)

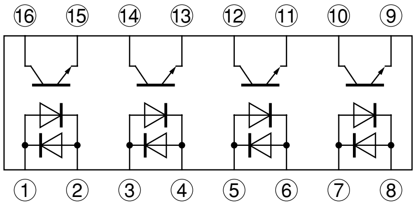
■ Applications

1. Programmable controllers
2. Facsimiles
3. Telephones

Notice The content of data sheet is subject to change without prior notice.
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

Sheet No.: D2-A02201EN
Date Sep. 30. 2003

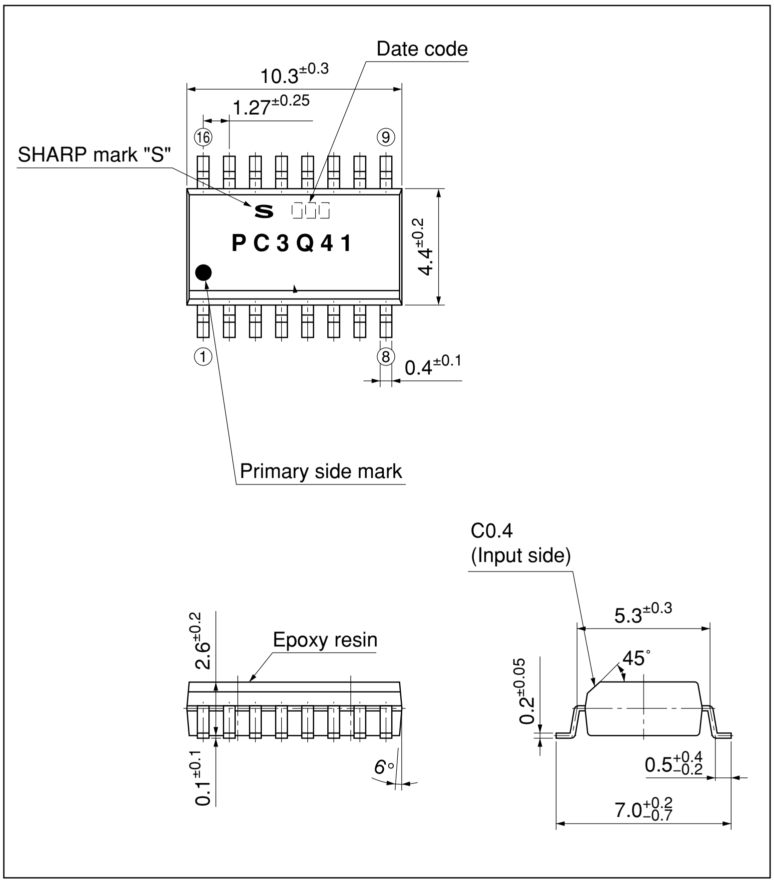
■ Internal Connection Diagram



①③⑤⑦ Anode / Cathode
②④⑥⑧ Cathode / Anode
⑨⑪⑬⑮ Emitter
⑩⑫⑭⑯ Collector

■ Outline Dimensions

(Unit : mm)



Product mass : approx. 0.3g

Date code (3 digit)

1st digit				2nd digit		3rd digit	
Year of production				Month of production		Week of production	
A.D.	Mark	A.D	Mark	Month	Mark	Week	Mark
1990	A	2002	P	January	1	1st	1
1991	B	2003	R	February	2	2nd	2
1992	C	2004	S	March	3	3rd	3
1993	D	2005	T	April	4	4th	4
1994	E	2006	U	May	5	5, 6th	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

■ Absolute Maximum Ratings

(T_a=25˚C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	±10	mA
Input	*1 Peak forward current	I_{FM}	±200	mA
Input	Power dissipation	P	15	mW
Output	Collector-emitter voltage	V_{CEO}	*4 80	V
Output	Emitter-collector voltage	V_{ECO}	6	V
Output	Collector current	I_C	50	mA
Output	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
*4 Up to Date code "P9" (september 2002) V_{CEO} : 70V

■ 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
Input	Terminal capacitance		C_t	V=0, f=1kHz	–	30	250	pF
Output	Collector dark current		I_{CEO}	V_{CE}=50V, I_F=0	–	–	100	nA
Output	Collector-emitter breakdown voltage		BV_{CEO}	I_C=0.1mA, I_F=0	*5 80	–	–	V
Output	Emitter-collector breakdown voltage		BV_{ECO}	I_E=10µA, I_F=0	6	–	–	V
Transfer characteristics	Collector current		I_C	I_F=±0.5mA, V_{CE}=5V	0.25	–	2.0	mA
Transfer characteristics	Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_F=±10mA, I_C=1mA	–	–	0.2	V
Transfer characteristics	Isolation resistance		R_{ISO}	DC500V, 40 to 60%RH	5×10^{10}	1×10^{11}	–	Ω
Transfer characteristics	Floating capacitance		C_f	V=0, f=1MHz	–	0.6	1.0	pF
Transfer characteristics	Response time	Rise time	t_r	V_{CE}=2V, I_C=2mA, R_L=100Ω	–	4	18	µs
Transfer characteristics	Response time	Fall time	t_f	V_{CE}=2V, I_C=2mA, R_L=100Ω	–	3	18	µs
Transfer characteristics	Common mode rejection voltage		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

*5 Up to Date code "P9" (September 2002)BV_{CEO}≥70V.

Fig.1 Test Circuit for Common Mode Rejection Voltage

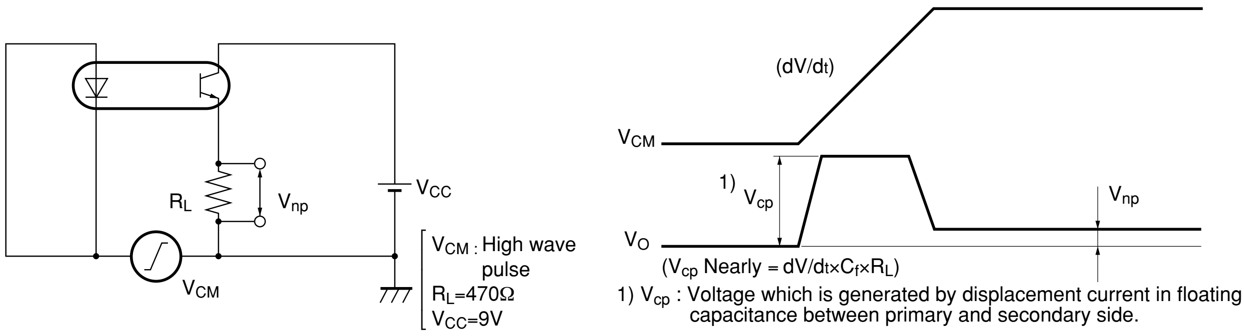


Fig.2 Forward Current vs. Ambient Temperature

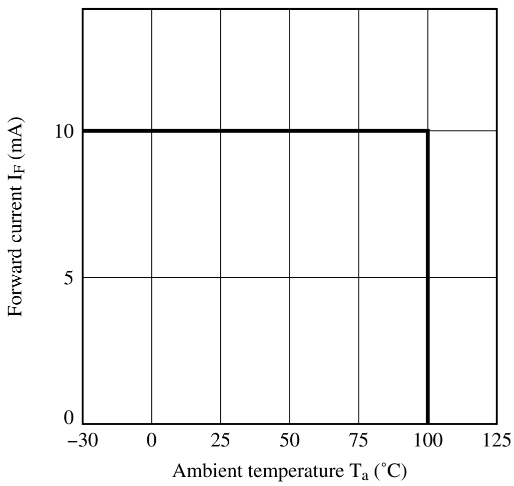


Fig.3 Diode Power Dissipation vs. Ambient Temperature

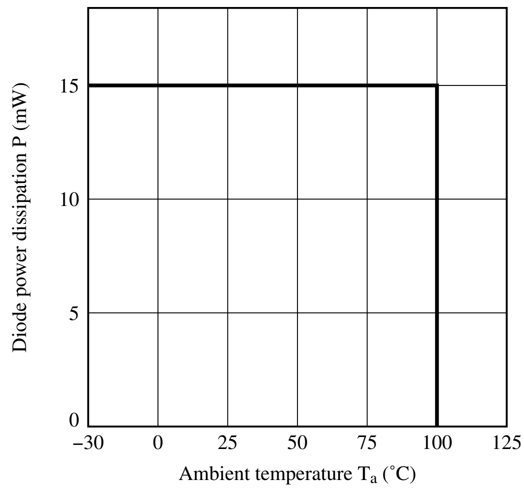


Fig.4 Collector Power Dissipation vs. Ambient Temperature

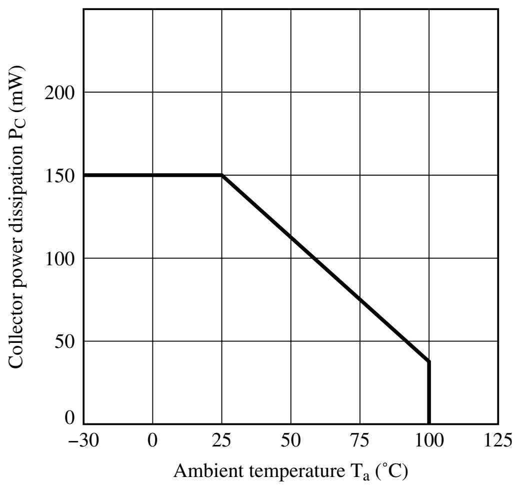


Fig.5 Total Power Dissipation vs. Ambient Temperature

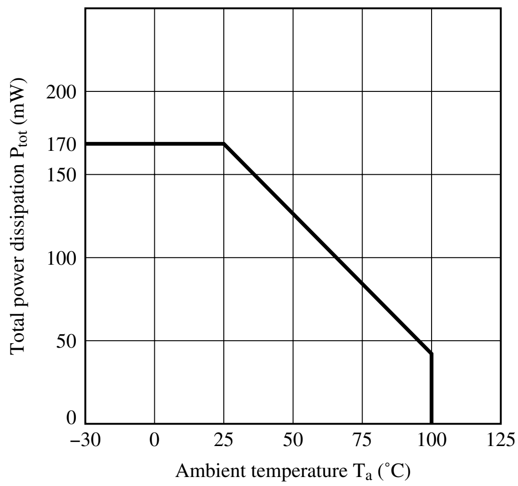


Fig.6 Peak Forward Current vs. Duty Ratio

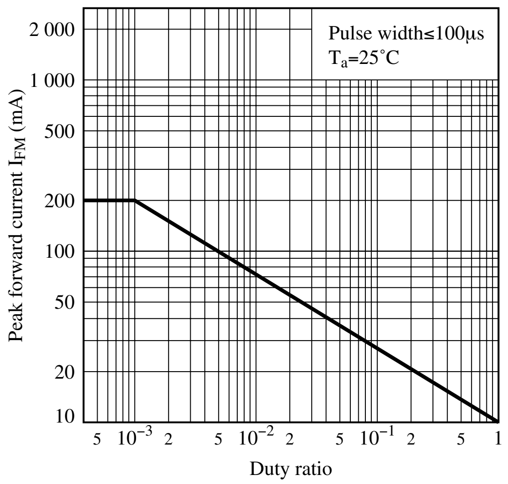


Fig.7 Forward Current vs. Forward Voltage

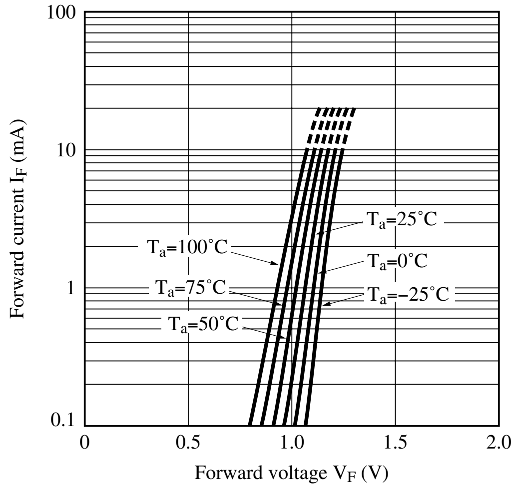


Fig.8 Current Transfer Ratio vs. Forward Current

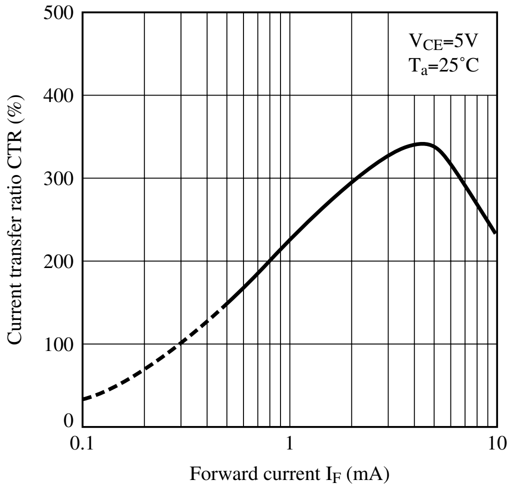


Fig.9 Collector Current vs. Collector-emitter Voltage

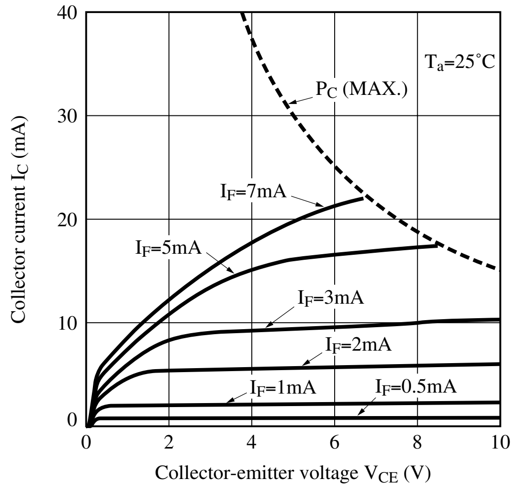


Fig.10 Relative Current Transfer Ratio vs. Ambient Temperature

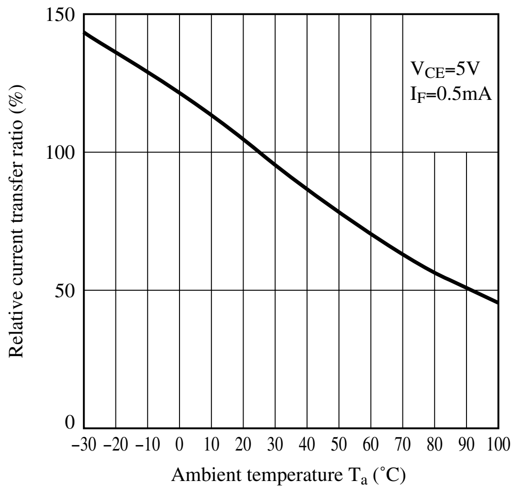


Fig.11 Collector - emitter Saturation Voltage vs. Ambient Temperature

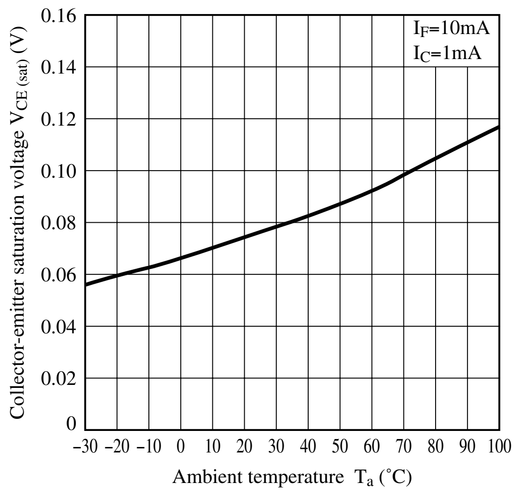


Fig.12 Collector Dark Current vs. Ambient Temperature

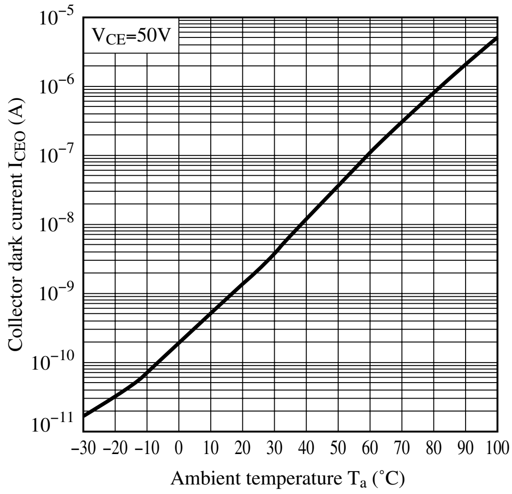


Fig.13 Response Time vs. Load Resistance (active region)

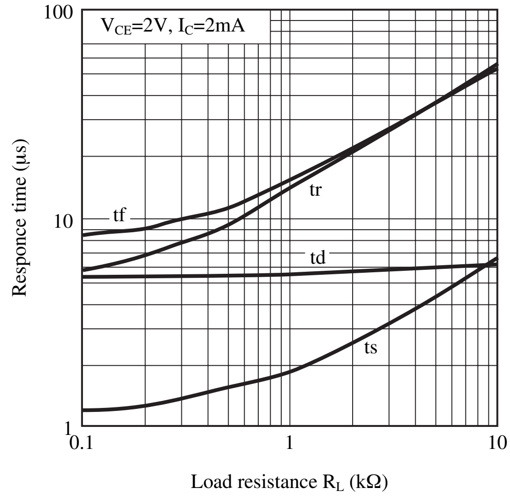


Fig.14 Response Time vs. Load Resistance (saturation region)

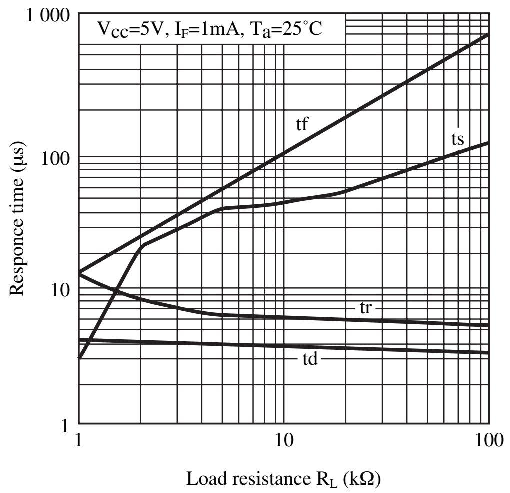
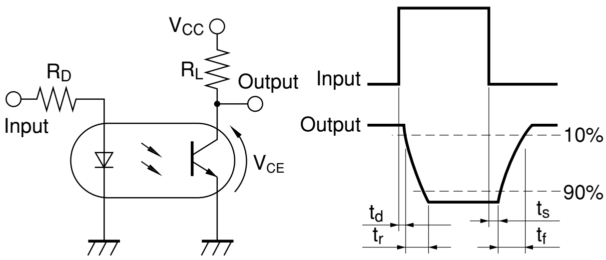


Fig.15 Test Circuit for Response Time



Please refer to the conditions in Fig.13 and Fig.14

Fig.16 Frequency Response

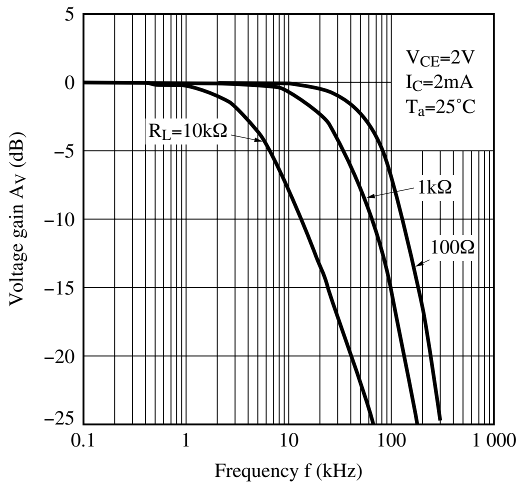
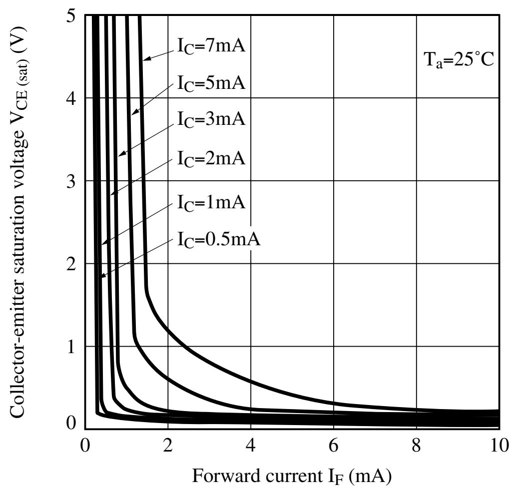


Fig.17 Collector-emitter Saturation Voltage vs. Forward Current



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.

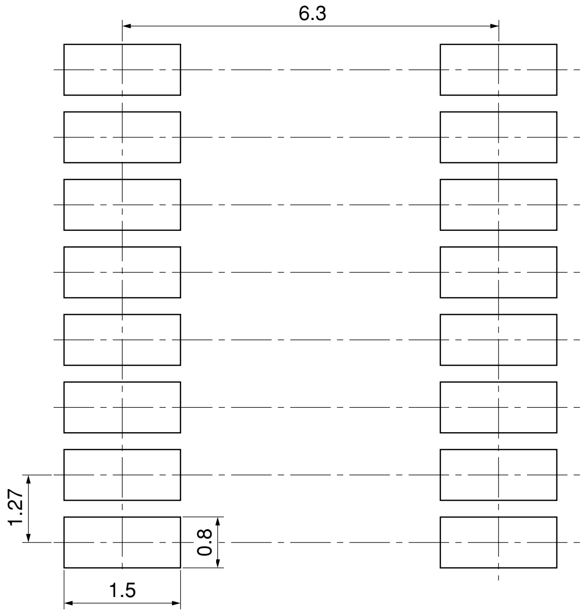
In case that some sudden big noise caused by voltage variation is provided between primary and secondary terminals of photocoupler some current caused by it is floating capacitance may be generated and result in false operation since current may go through IRED or current may change.
If the photocoupler 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 5years) into the design consideration.

● Recommended Foot Print (reference)



(Unit : mm)

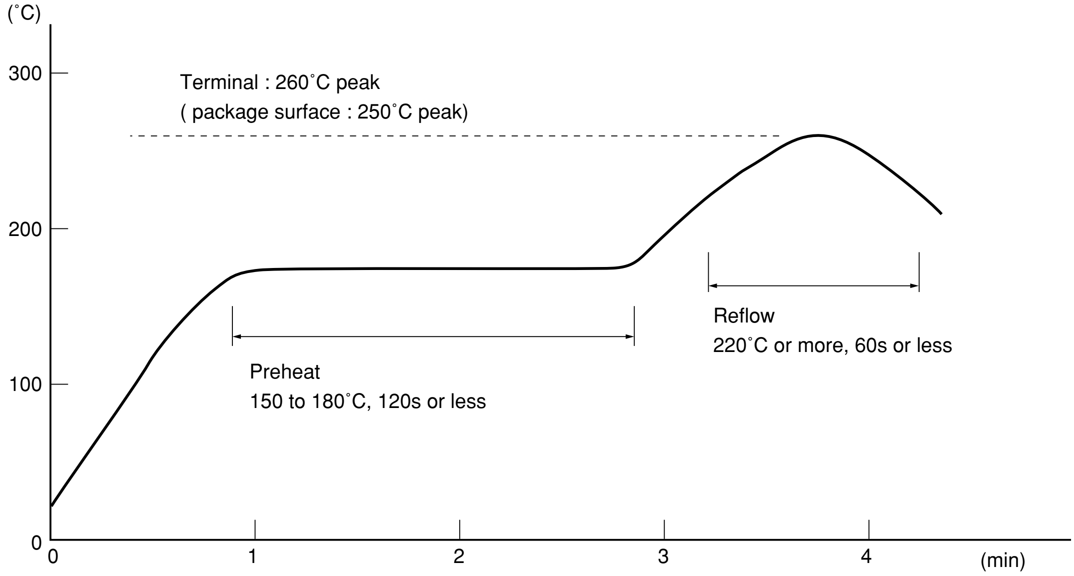
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

■ 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 260˚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 3minutes 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 device.

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.

■ Package specification

● Tape and Reel package

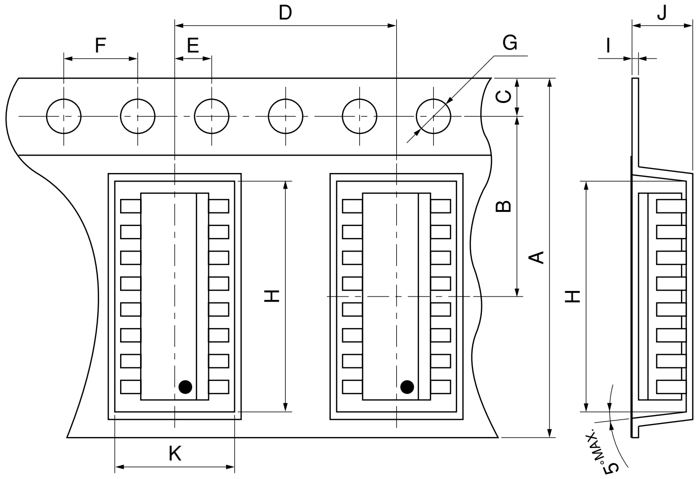
Package materials

Carrier tape : PS

Cover tape : PET (three layer system)

Reel : PS

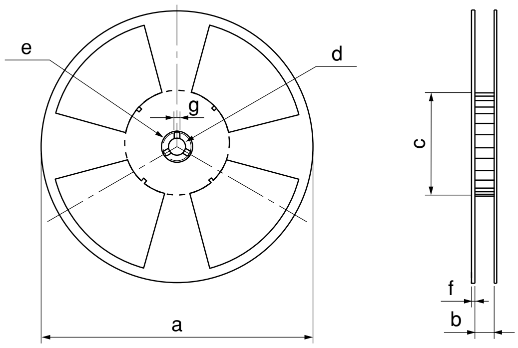
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
$24.0^{\pm0.3}$	$11.5^{\pm0.1}$	$1.75^{\pm0.1}$	$12.0^{\pm0.1}$	$2.0^{\pm0.1}$	$4.0^{\pm0.1}$	$\phi1.5^{+0.1}_{-0}$
H	**I**	**J**	**K**			
$10.8^{\pm0.1}$	$0.4^{\pm0.05}$	$3.0^{\pm0.1}$	$7.4^{\pm0.1}$			

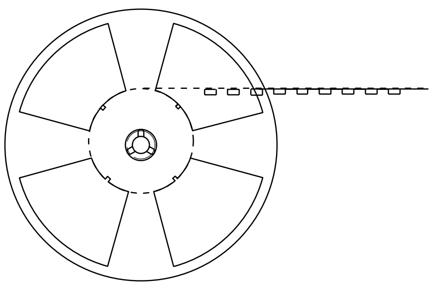
Reel structure and Dimensions

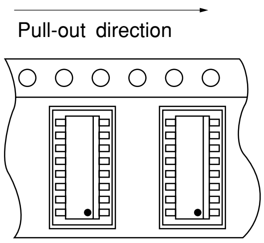


Dimensions List (Unit : mm)

a	b	c	d
330	$25.5^{\pm1.5}$	$100^{\pm1.0}$	$13^{\pm0.5}$
e	**f**	**g**	
$23^{\pm1.0}$	$2.0^{\pm0.5}$	$2.0^{\pm0.5}$	

Direction of product insertion





[Packing : 1 000pcs/reel]

■ Important Notices

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