

PC411S0NIP0F

High Speed 15Mb/s, High CMR
SOP 8 pin OPIC Photocoupler

■ Description

PC411S contains a LED optically coupled a OPIC.

It is packaged in a 8-pin SOP.

Input-output isolation voltage(rms) is 3.75kV.

High speed response (TYP.15Mb/s) and CMR is MIN. 15kV/ μ s

■ Features

1. Double transfer mold package (ideal for Flow Soldering)
2. High speed response (t_{PHL} , t_{PLH} : MAX. 60ns)
3. High noise reduction type (CMR=MIN. 15kV/ μ s at $V_{CM}=1$ kV)
4. High isolation voltage ($V_{iso}=3.75$ kV)

■ Agency approvals / Compliance

- 1.UL1577 (Double protection isolation), file No.E64380 (as model No.PC411S)
- 2.DIN EN60747-5-2(Under preparation)

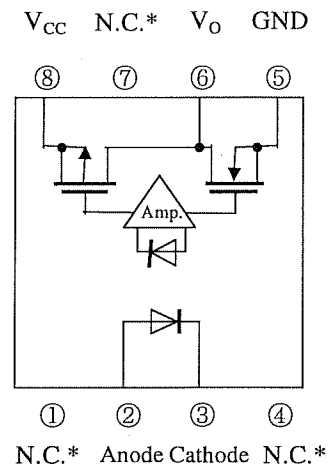
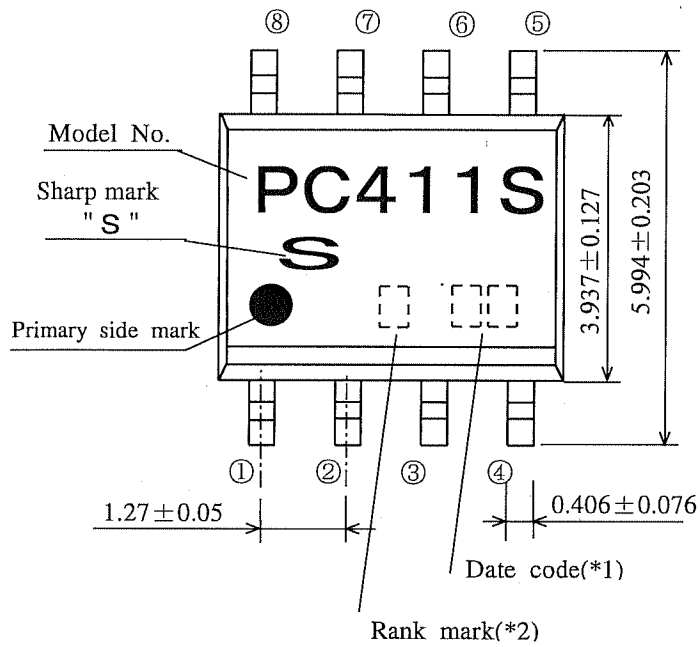
■ Application

- Digital fieldbus isolation:
CC-Link,DeviceNet,Profibus,SDS
1. Programmable controller
 2. Inverter
 3. AC servo
 4. Actuator
 5. PDP

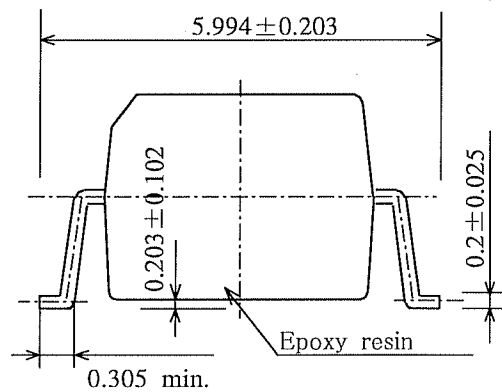
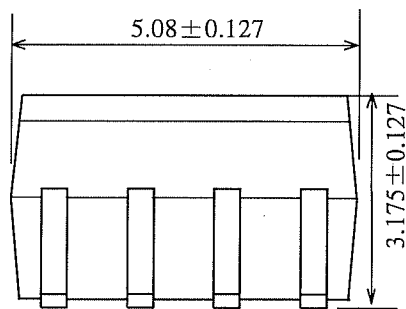
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Internal Connection Diagram

Pin Nos. and internal connection diagram



※ N.C.terminal(①,④,⑦) is not allowed external connection.

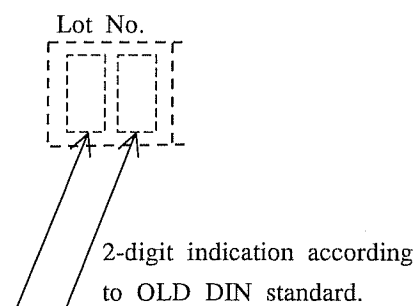


Product mass : Approx. 0.15g

- *1) 2-digit number shall be marked according to OLD DIN standard.
- *2) Rank mark shall be or shall not be marked.
- *3) Pin material: Cu Alloy Pin finish: Pd

• Lot No. (2digit) code

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



■ Absolute Maximum Ratings

Ta=25°C

	Parameter	Symbol	Rating	Unit
Input	*1 Forward input current	I _F	20	mA
	Reverse input voltage	V _R	5	V
Output	Supply voltage	V _{CC}	0 to 6	V
	Output voltage	V _O	-0.5 to V _{CC} +0.5	V
	Output current	I _O	2	mA
	*2 Isolation voltage	V _{iso(rms)}	3.75	kV
	Operating temperature	T _{opr}	-40 to +100	°C
	Storage temperature	T _{stg}	-55 to +125	°C
	*3 Soldering temperature	T _{sol}	270	°C

*1 The derating factors of forward current vs. ambient temperature are shown in Fig. 3.

*2 AC for 1min, 40 to 60%RH, f=60Hz

*2 For 10 s

■ Electro-optical Characteristics *4

Unless otherwise specified.: Ta=-40 to +100°C, V_{CC}=4.5 to 5.5V, All typicals at V_{CC}=5V, Ta=25°C

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions		
Input	Forward Voltage	V _F	1.3	1.5	1.8	V	I _F =12mA		
	Reverse current	I _R	-	-	10	μA	Ta=25°C, V _R =5V		
	Terminal capacitance	C _I	-	60	150	pF	Ta=25°C, V=0, f=1MHz		
Output	Low level output voltage	V _{OL}	-	1.5	100	mV	I _O =20 μA, I _F =12mA		
	High level output voltage	V _{OH}	4	5	-	V	I _O =20 μA, I _F =0		
	High level supply current	I _{CCH}	-	2.6	11	mA	I _F =0		
	Low level supply current	I _{CCL}	-	2.1	14	mA	I _F =12mA		
Transfer characteristics	"H→L" threshold input current	I _{FHL}	-	3.5	6	mA	V _{CC} =5V, V ₀ =2.5V		
	Isolation resistance	R _{ISO}	5×10 ¹⁰	10 ¹¹	-	Ω	Ta=25°C, DC=500V, 40~60%RH		
	Floating capacitance	C _F	-	0.6	-	pF	Ta=25°C, V=0, f=1MHz		
	Response time	"High→Low" propagation delay time *5	t _{PHL}	20	27	60	ns	I _F =12mA, C _L =15pF CMOS logic level t _r =t _f <1ns pulse width 100ns Duty 50% Fig.1	
		"Low→High" propagation delay time *5	t _{PLH}	13	35	60			
		Fall time *5	t _f	-	3	-			
		Rise time *5	t _r	-	4	-			
		Distortion of pulse width t _{PHL} -t _{PLH} *5	Δtw	-	8	30			
		Propagation delay skew *5	t _{PSK}	-	-	40			
	CMR	Instantaneous common mode rejection voltage (High level output) *6	CM _H	15	20	-	kV/μs	I _F =0, V _O (MIN.)=2V	Ta=25°C, V _{CC} =5V, V _{CM} =1kV _(P-P) Fig.2
Instantaneous common mode rejection voltage (Low level output) *6		CM _L	-15	-20	-	kV/μs	I _F =12mA, V _O (MAX.)=0.8V		

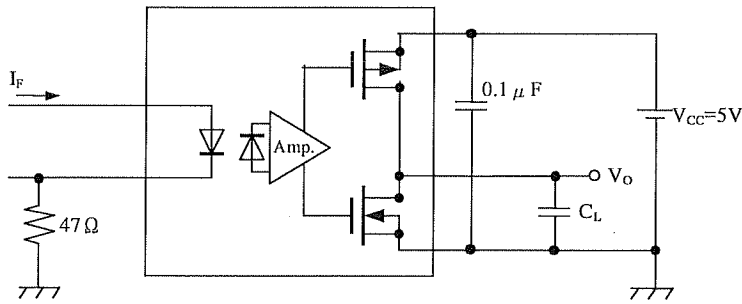
*4 It is necessary to connect a by-pass capacitor of 0.01 μF or more between V_{CC}(Pin No.8) and GND(Pin No.5) near the device, when it measures the transfer characteristics and the output side characteristics.

*5 Propagation delay time : Refer to Fig.1.

*6 Instantaneous common mode rejection voltage : Refer to Fig.2.

■ Test Circuit

Fig.1 t_{PHL} , t_{PLH} , t_r , t_f test circuit



* C_L contains probe and wiring capacity.

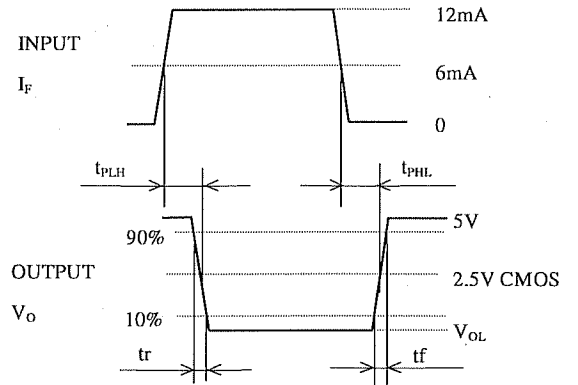
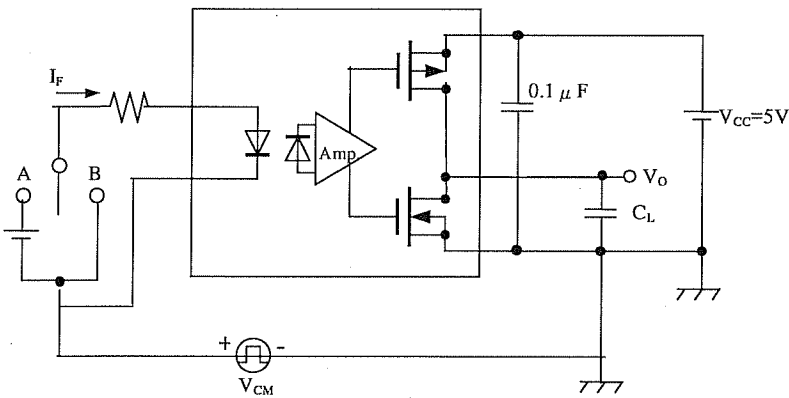


Fig.2 CM_H , CM_L test circuit



Timing diagram

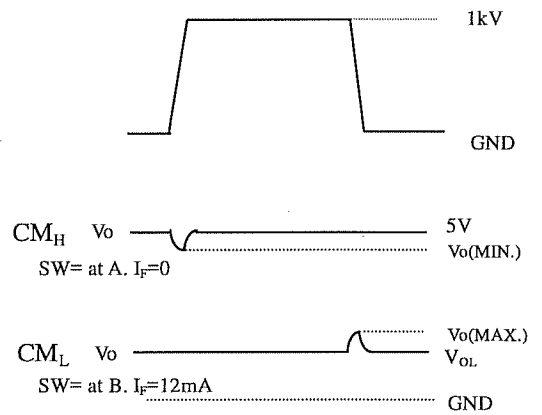
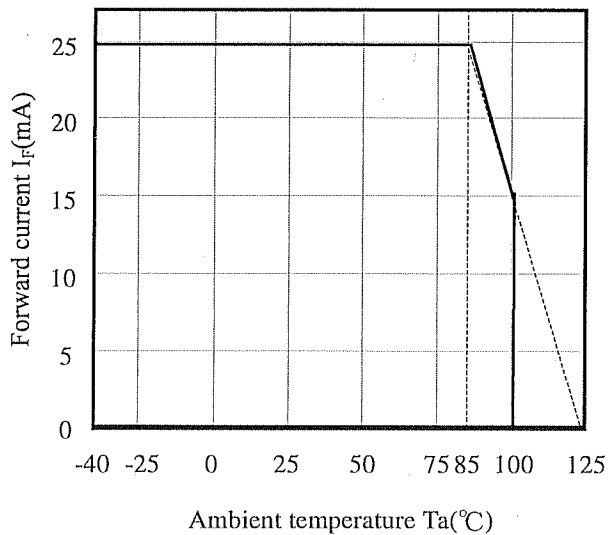


Fig.3 Forward current vs. ambient temperature



■ Design Consideration**● Recommended operating condition (reference)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input current	I_F	10	-	16	mA
Power supply voltage	V_{CC}	4.5	-	5.5	V
Operating temperature	T_{opr}	-40	-	+100	°C

Sharp recommends usage of the device under the above conditions to secure reliability and allowance for over time degradation of light emitting diode.

● Design guide

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

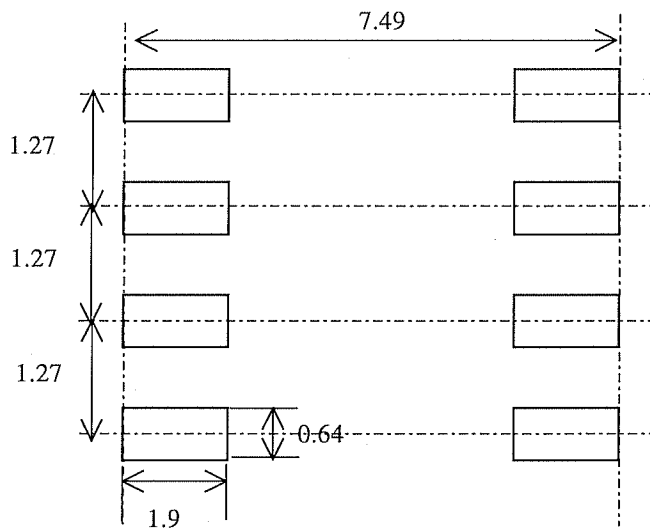
•The detector which is used in this device, has parasitic diode between each pins and GND.

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.

■ Design Condition**● Recommend Foot Print (reference)**

SOP-8pin Photocoupler recommended land pattern



(Unit:mm)

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

■ Manufacturing Guideline

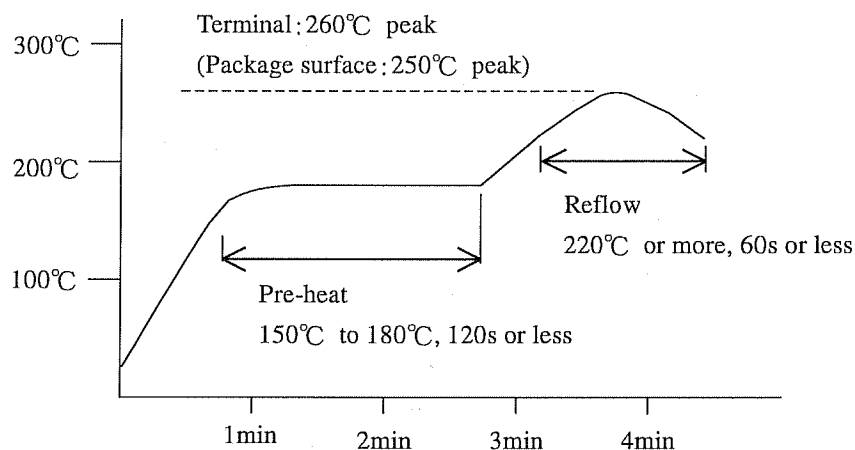
● Soldering Method

• Reflow Soldering :

Reflow soldering should follow the temperature profile 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°C and within 10s.

Preheating is within the bounds of 100 to 150 °C and 30 to 80 s.

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 soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the twice 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 min 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 condition in advance of mass production.

• Recommended solvent materials :

Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

In cases 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 package 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 : CFC_s, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBBO_s, and PBB_s are not used in this product at all.

■ **Tape and Reel package**

• **SMT Package materials**

Carrier tape : PS (with and anti-static material)

Cover tape : PET (three layer system)

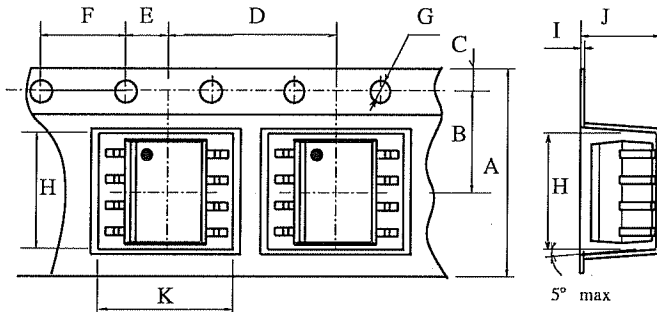
Reel : PS

• **package method**

MAX. 1500 pcs. of products shall be package in a carrier tape.

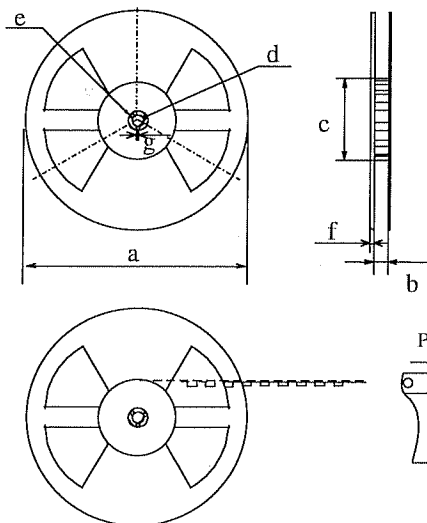
MAX. 4 reels are packed in one carton.

• **Carrier tape structure and dimensions**



A	B	C	D	E	F	G	H
12.0±0.3	5.5±0.05	1.75±0.1	8.0±0.1	2.0±0.05	4.0±0.1	1.55±0.05	5.4±0.1
I	J	K					
0.3±0.05	3.7±0.1	6.3±0.1					

• **Reel structure and dimensions**



Dimension List

a	b	c	d
330	13.5±1.5	100±1.0	13±0.2
e	f	g	
21±0.8	2.0TYP.	2.0±0.5	

(Unit : mm)

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 - Alarm equipment
 - Various safety devices, etc.
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