

# PC410L0NIP

## High Speed Response, High CMR OPIC Photocoupler

### ■ Features

1. High resistance to noise due to high common rejection voltage (CMR:MIN. 10kV/ $\mu$ s)
2. High speed response ( $t_{pLH}$ ,  $t_{pHL}$ :MAX.75ns)
3. Isolation voltage between input and output ( $V_{iso(rms)}$ :3.75kV)
4. Mini-flat package

### ■ Applications

1. Programmable controllers
2. Inverters

### ■ Absolute Maximum Ratings ( $T_a=25^\circ\text{C}$ )

	Parameter	Symbol	Rating	Unit
Input	*1 Forward current	$I_F$	20	mA
	Reverse voltage	$V_R$	5	V
	Power dissipation	P	40	mW
Output	Supply voltage	$V_{CC}$	7	V
	High level output voltage	$V_{OH}$	7	V
	Low level output current	$I_{OL}$	50	mA
	*2 Collector power dissipation	$P_C$	85	mW
	*3 Isolation voltage	$V_{iso(rms)}$	3.75	kV
	Operating temperature	$T_{opr}$	-40 to +85	$^\circ\text{C}$
	Storage temperature	$T_{stg}$	-40 to +125	$^\circ\text{C}$
	*4 Soldering temperature	$T_{sol}$	270	$^\circ\text{C}$

\*1 Refer to Fig.4

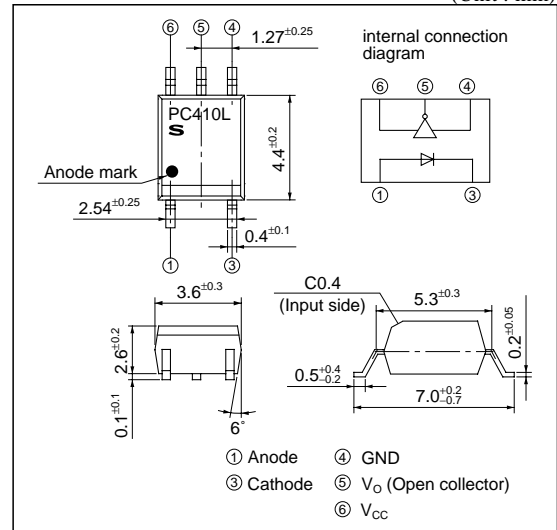
\*2 Refer to Fig.5

\*3 40 to 60%RH, AC for 1minute

\*4 For 10s

### ■ Outline Dimensions

(Unit : mm)



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

## ■ Electro-optical Characteristics

(Unless otherwise specified,  $T_a = -40$  to  $85^\circ\text{C}$ )

Parameter		Symbol	Conditions		MIN.	TYP.	MAX.	Unit
Input	Forward voltage	$V_F$	$T_a = 25^\circ\text{C}$ , $I_F = 10\text{mA}$		–	1.6	1.9	V
	Reverse current	$I_R$	$T_a = 25^\circ\text{C}$ , $V_R = 5\text{V}$		–	–	10	$\mu\text{A}$
	Terminal capacitance	$C_t$	$T_a = 25^\circ\text{C}$ , $V = 0$ , $f = 1\text{MHz}$		–	60	150	$\text{pF}$
Output	Low level output voltage	$V_{OL}$	$I_{OL} = 13\text{mA}$ , $V_{CC} = 5.5\text{V}$ , $I_F = 5\text{mA}$		–	0.4	0.6	V
	High level output current	$I_{OH}$	$V_{CC} = V_O = 5.5\text{V}$ , $I_F = 250\mu\text{A}$		–	0.02	100	$\mu\text{A}$
	Low level supply current	$I_{CCL}$	$V_{CC} = 5.5\text{V}$ , $I_F = 10\text{mA}$		–	7	13	$\text{mA}$
	High level supply current	$I_{CCH}$	$V_{CC} = 5.5\text{V}$ , $I_F = 0$		–	5	10	$\text{mA}$
	"High→Low" threshold input current	$I_{FHL}$	$V_{CC} = 5\text{V}$ , $V_O = 0.8\text{V}$ , $R_L = 350\Omega$		–	2.5	5	$\text{mA}$
	Isolation resistance	$R_{ISO}$	$T_a = 25^\circ\text{C}$ , $\text{DC} = 500\text{V}$ , 40 to 60% RH		$5 \times 10^{10}$	$1 \times 10^{11}$	–	$\Omega$
Floating capacitance		$C_f$	$T_a = 25^\circ\text{C}$ , $V = 0$ , $f = 1\text{MHz}$		–	0.6	–	$\text{pF}$
Transfer characteristics	Response time	"High→Low" propagation delay time	$t_{PHL}$	$T_a = 25^\circ\text{C}$ $V_{CC} = 5\text{V}$ , $I_F = 7.5\text{mA}$ $R_L = 350\Omega$ , $C_L = 15\text{pF}$	25	48	75	ns
		"Low→High" propagation delay time	$t_{PLH}$		25	50	75	ns
		Rise time	$t_r$		–	10	–	ns
		Fall time	$t_f$		–	20	–	ns
		*5 Pulse width distortion	$\Delta t_W$		–	–	35	ns
	CMR	Instantaneous common mode rejection voltage "Output : High level"	$CM_H$		$I_F = 0$ $V_{O(\text{Min})} = 2\text{V}$	$T_a = 25^\circ\text{C}$ $V_{CC} = 5\text{V}$ $V_{CM} = 1\text{kV(P-P)}$ $R_L = 350\Omega$	10	20
Instantaneous common mode rejection voltage "Output : Low level"		$CM_L$	$I_F = 5\text{mA}$ $V_{O(\text{Max})} = 0.8\text{V}$	–10	–20		–	$\text{kV}/\mu\text{s}$

(Note) All typical values: at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ \*5 Pulse width distortion  $\Delta t_W = |t_{PHL} - t_{PLH}|$ 

## ■ Recommended Operating Conditions

Parameter	Symbol	MIN.	MAX.	Unit
Low level input current	$I_{FL}$	0	250	$\mu\text{A}$
High level input current	$I_{FH}$	8	15	$\text{mA}$
Supply voltage	$V_{CC}$	4.5	5.5	V
Fanout (TTL load)	N	–	5	–
Operating temperature	$T_{opr}$	–40	+85	$^\circ\text{C}$

Connect a by-pass ceramic capacitor (0.01 to 0.1 $\mu\text{F}$ ) between  $V_{CC}$  and GND at the position within 1cm from lead pin

### Fig.1 Block Diagram

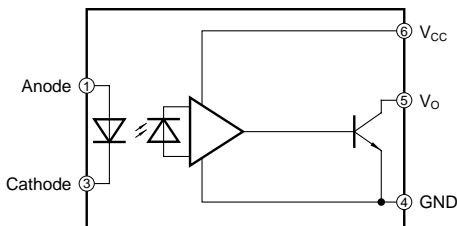


Fig.2 Test Circuit for  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_r$  and  $t_f$

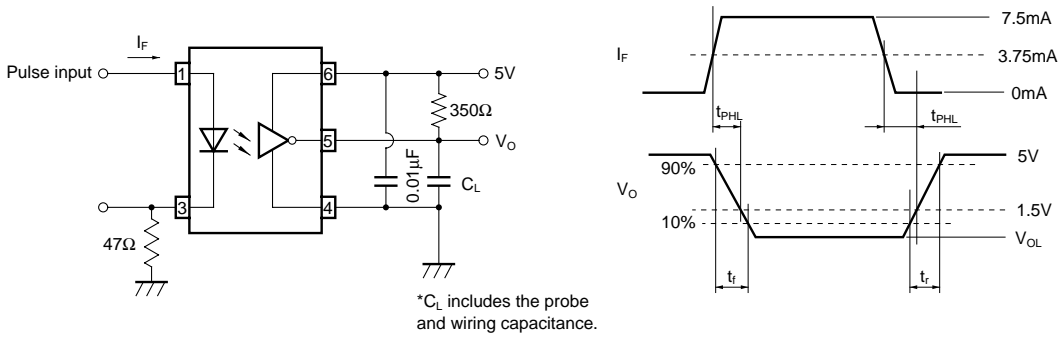


Fig.3 Test Circuit for Common Mode Rejection Voltage

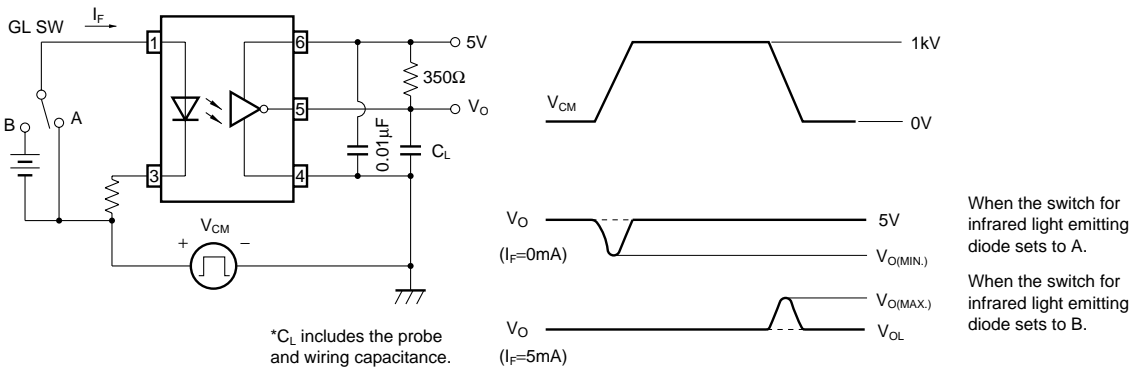


Fig.4 Forward Current vs. Ambient Temperature

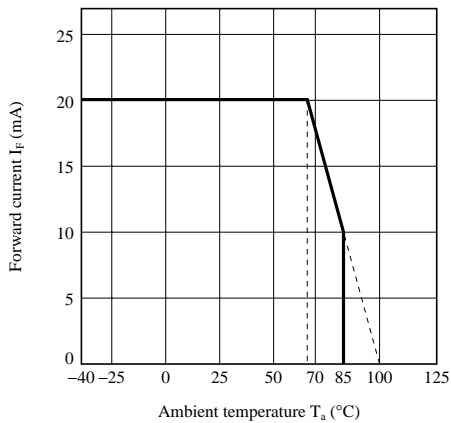
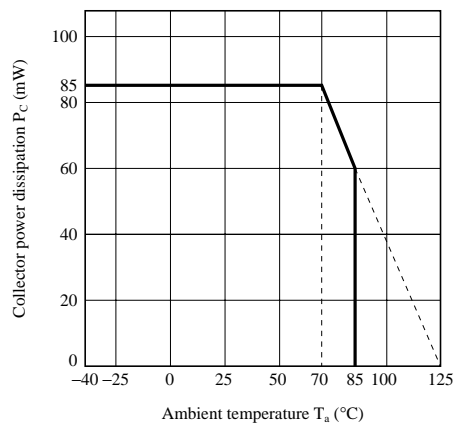
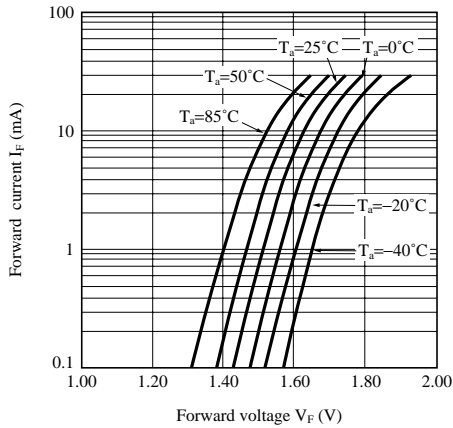


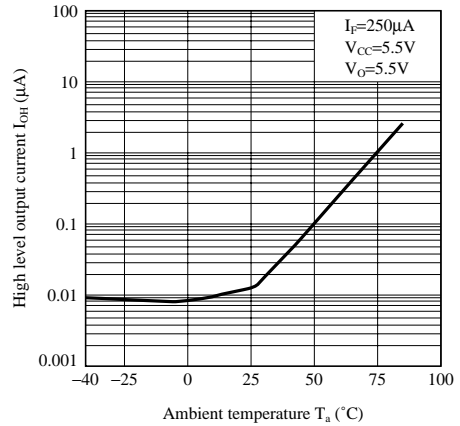
Fig.5 Collector Power Dissipation vs. Ambient Temperature



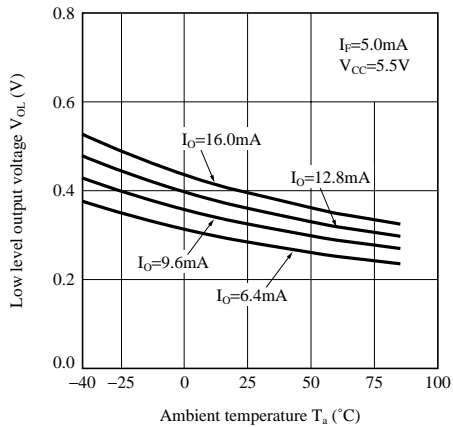
**Fig.6 Forward Current vs. Forward Voltage**



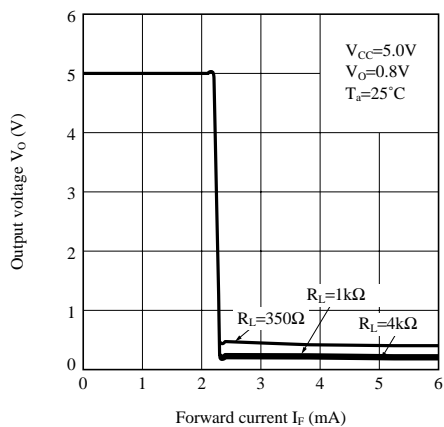
**Fig.7 High Level Output Current vs. Ambient Temperature**



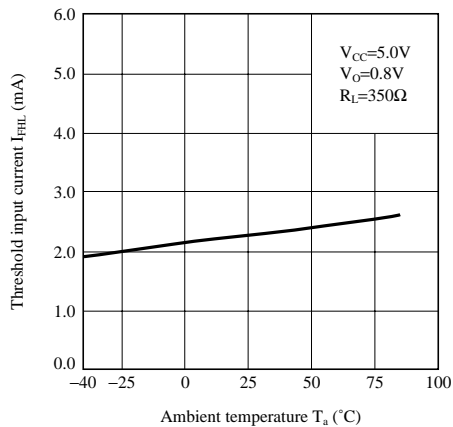
**Fig.8 Low Level Output Voltage vs. Ambient Temperature**



**Fig.9 Output Voltage vs. Forward Current**



**Fig.10 Threshold Input Current vs. Ambient Temperature**



**Fig.11 Propagation Delay Time vs. Forward Current**

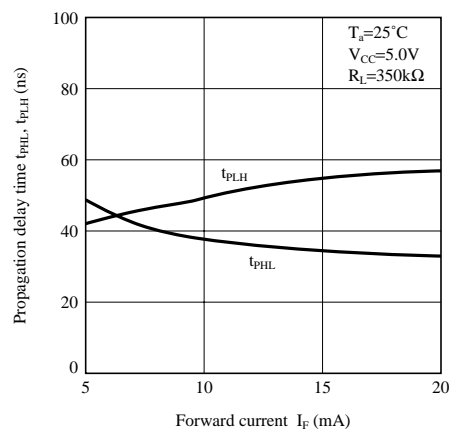
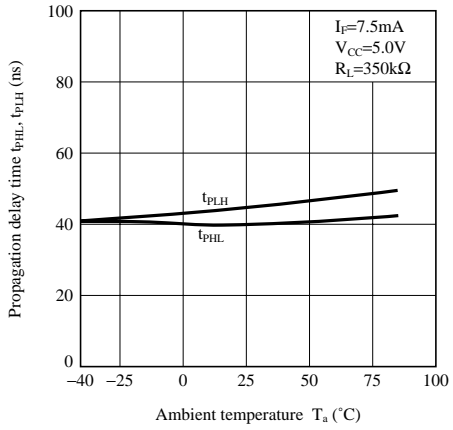


Fig.12 Propagation Delay Time vs. Ambient Temperature



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