

# PC910X

## Ultra-high Speed Response OPIC Photocoupler

### ■ Features

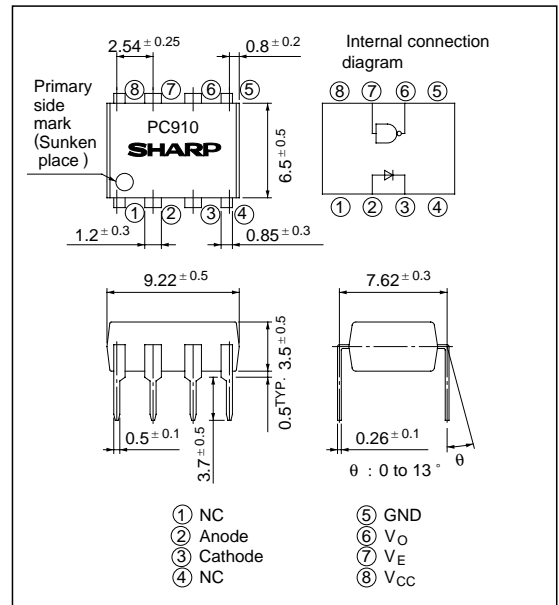
1. Ultra-high speed response  
( $t_{PHL}$ ,  $t_{PLH}$  : TYP. 50ns at  $R_L = 350\Omega$ )
2. Isolation voltage between input and output  
( $V_{iso}$  : 2 500V<sub>rms</sub>)
3. Low input current drive( $I_{FHL}$  : MAX. 5mA )
4. Instantaneous common mode rejection  
voltage( $CM_H$  : TYP. 500V/ $\mu$ s)
5. TTL and LSTTL compatible output
6. Recognized by UL, file No. E64380

### ■ Applications

1. High speed interfaces for computer peripherals and microcomputer systems
2. High speed line receivers
3. Noise-cut
4. Interfaces with various data transmission equipment

### ■ 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.

### ■ Absolute Maximum Ratings

(Ta = 25°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	*2 Supply voltage	$V_{CC}$	7	V
	*3 Enable voltage	$V_E$	5.5	V
	High level output voltage	$V_{OH}$	7	V
	Low level output current	$I_{OL}$	50	mA
	Collector power dissipation	$P_C$	85	mW
*4 Isolation voltage	$V_{iso}$	2 500	V <sub>rms</sub>	
Operating temperature	$T_{opr}$	0 to + 70	°C	
Storage temperature	$T_{stg}$	- 55 to + 125	°C	
*5 Soldering temperature	$T_{sol}$	260	°C	

\*1 Ta = 0 to 70°C

\*2 For 1 minute max.

\*3 Shall not exceed 500mV from supply voltage( $V_{CC}$ ).

\*4 AC for 1minute, 40 to 60% RH. Apply the specified voltage between the whole of the electrode pins on the input side and the whole of the electrode pins on the output side.

\*5 For 10 seconds at the position of 2mm or more from lead pins.

## ■ Electro-optical Characteristics

(Unless otherwise specified, Ta = 0 to 70°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit		
Input	Forward voltage	V <sub>F</sub>	Ta = 25°C, I <sub>F</sub> = 10mA	-	1.6	1.9	V		
	Reverse current	I <sub>R</sub>	Ta = 25°C, V <sub>R</sub> = 5V	-	-	10	μA		
	Terminal capacitance	C <sub>t</sub>	Ta = 25°C, V = 0, f = 1MHz	-	60	150	pF		
Output	High level output current	I <sub>OH</sub>	V <sub>CC</sub> = V <sub>O</sub> = 5.5V, V <sub>E</sub> = 2.0V, I <sub>F</sub> = 250 μA	-	2	250	μA		
	Low level output voltage	V <sub>OL</sub>	V <sub>CC</sub> = 5.5V, V <sub>E</sub> = 2.0V, I <sub>F</sub> = 5mA, I <sub>OL</sub> = 13mA	-	0.4	0.6	V		
	High level enable current	I <sub>EH</sub>	V <sub>CC</sub> = 5.5V, V <sub>E</sub> = 2.0V	-	- 0.8	- 1.8	mA		
	Low level enable current	I <sub>EL</sub>	V <sub>CC</sub> = 5.5V, V <sub>E</sub> = 0.5V	-	- 1.2	- 2.0	mA		
	High level supply current	I <sub>CCH</sub>	V <sub>CC</sub> = 5.5V, I <sub>F</sub> = 0, V <sub>E</sub> = 0.5V	-	7	15	mA		
	Low level supply current	I <sub>CCL</sub>	V <sub>CC</sub> = 5.5V, I <sub>F</sub> = 10mA, V <sub>E</sub> = 0.5V	-	13	18	mA		
	Transfer characteristics	“High→Low” threshold input current	I <sub>FHL</sub>	V <sub>CC</sub> = 5V, V <sub>E</sub> = 2.0V V <sub>O</sub> = 0.8V, R <sub>L</sub> = 350Ω	-	2.5	5	mA	
Isolation resistance		R <sub>iso</sub>	Ta = 25°C, DC500V, 40 to 60% RH	5 × 10 <sup>10</sup>	10 <sup>10</sup>	-	Ω		
Floating capacitance		C <sub>f</sub>	Ta = 25°C, V = 0, f = 1MHz	-	0.6	5	pF		
Response time		“High→Low” propagation delay time	t <sub>PHL</sub>	Ta = 25°C, V <sub>CC</sub> = 5V R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF I <sub>F</sub> = 7.5mA	Fig. 1	-	50	120	ns
		“Low→High” propagation delay time	t <sub>PLH</sub>			-	50	120	ns
		Rise time, Fall time	t <sub>r</sub> , t <sub>f</sub>	-		30	60	ns	
		“High→Low” enable propagation delay time	t <sub>EHL</sub>	Ta = 25°C, V <sub>CC</sub> = 5V R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF I <sub>F</sub> = 7.5mA, V <sub>EH</sub> = 3V V <sub>EL</sub> = 0.5V		Fig. 2	-	15	50
“Low→High” enable propagation delay time			t <sub>ELH</sub>		-		65	100	ns
CMR		Instantaneous common mode rejection voltage “Output: High level”	CM <sub>H</sub>	Ta = 25°C, V <sub>CC</sub> = 5V, V <sub>CM</sub> = 10V <sub>(peak)</sub> R <sub>L</sub> = 350Ω, I <sub>F</sub> = 0, V <sub>O(MIN)</sub> = 2V	Fig. 3	100	500	-	V/μs
		Instantaneous common mode rejection voltage “Output: Low level”	CM <sub>L</sub>	Ta = 25°C, V <sub>CC</sub> = 5V, V <sub>CM</sub> = 10V <sub>(peak)</sub> R <sub>L</sub> = 350Ω, I <sub>F</sub> = 5mA, V <sub>O(MAX)</sub> = 0.8V	Fig. 3	- 100	- 500	-	V/μs

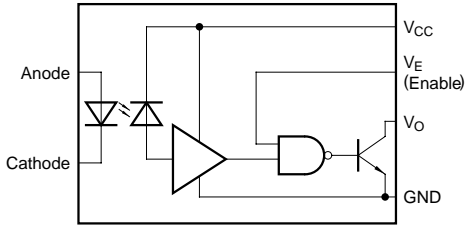
All typical values : at Ta = 25°C, V<sub>CC</sub> = 5V

## ■ Recommended Operating Conditions

Parameter	Symbol	MIN.	MAX.	Unit
Low level input current	I <sub>FL</sub>	0	250	μA
High level input current	I <sub>FH</sub>	7	15	mA
High level enable voltage	V <sub>EH</sub>	2.0	V <sub>CC</sub>	V
Low level enable voltage	V <sub>EL</sub>	0	0.8	V
Supply voltage	V <sub>CC</sub>	4.5	5.5	V
Fanout (TTL load)	N	-	8	-
Operating temperature	T <sub>opr</sub>	0	70	°C

- When the enable input is in high level state, external pull-up resistor is unnecessary.
- Connect a by-pass ceramic capacitor (0.01 to 0.1μF) between V<sub>CC</sub> and GND at the position within 1cm from pin.

Circuit Block Diagram

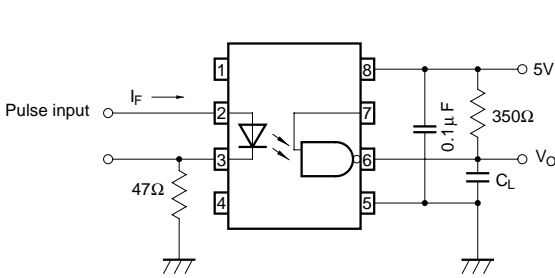


Truth Table

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H

L : Logic (0)  
H : Logic (1)

Fig. 1 Test Circuit for  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_r$  and  $t_f$



\* $C_L$  includes the probe and wiring capacitance.

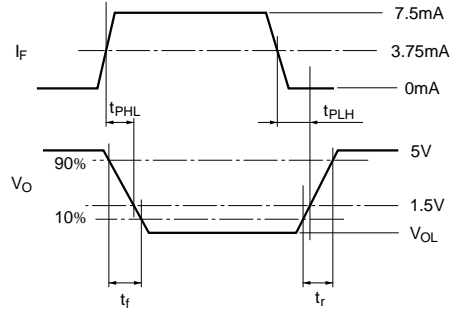


Fig. 2 Test Circuit for  $t_{EHL}$  and  $t_{ELH}$

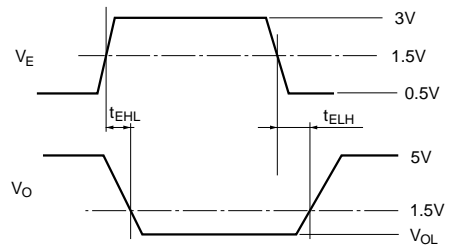
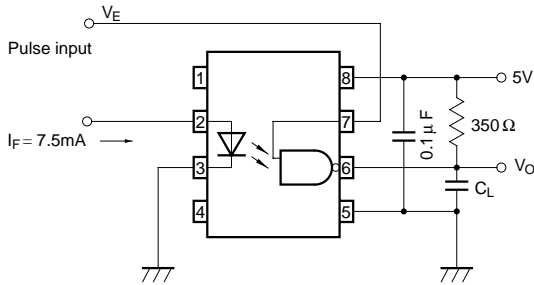
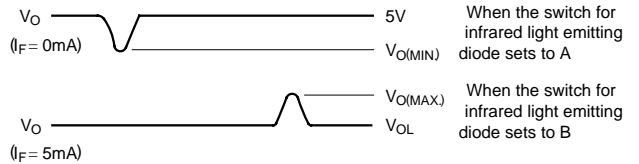
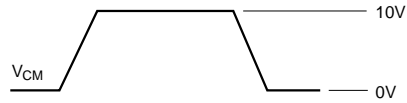
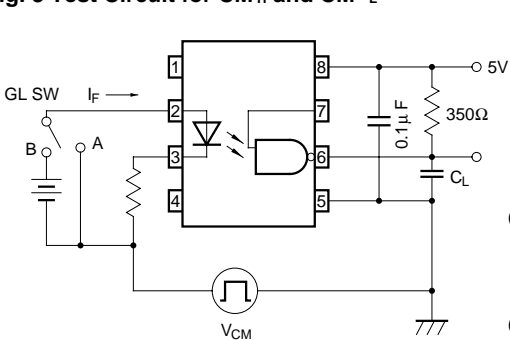
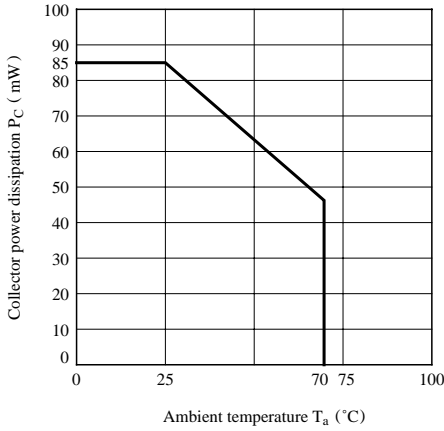


Fig. 3 Test Circuit for  $CM_H$  and  $CM_L$

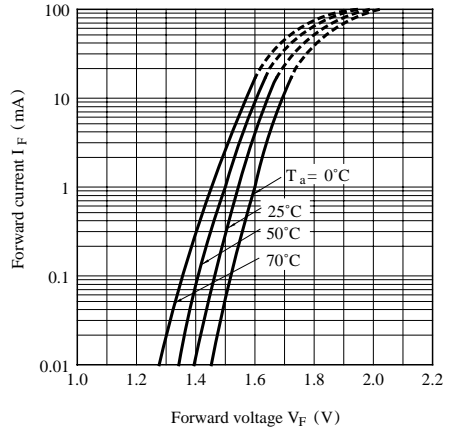


When the switch for infrared light emitting diode sets to A  
When the switch for infrared light emitting diode sets to B

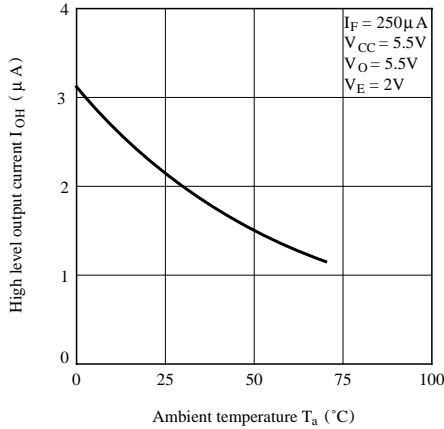
**Fig. 4 Collector Power Dissipation vs. Ambient Temperature**



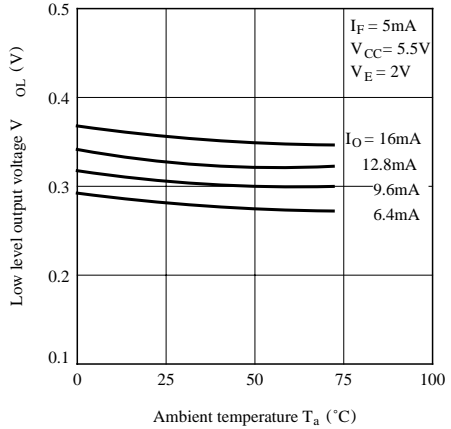
**Fig. 5 Forward Current vs. Forward Voltage**



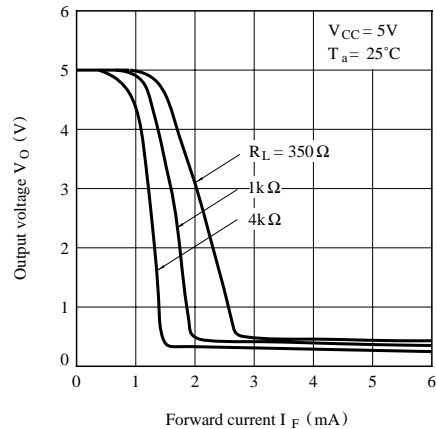
**Fig. 6 High Level Output Current vs. Ambient Temperature**



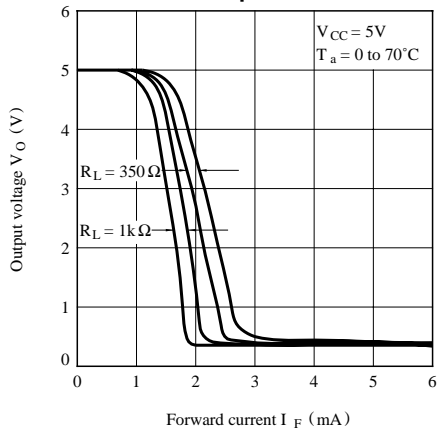
**Fig. 7 Low Level Output Voltage vs. Ambient Temperature**



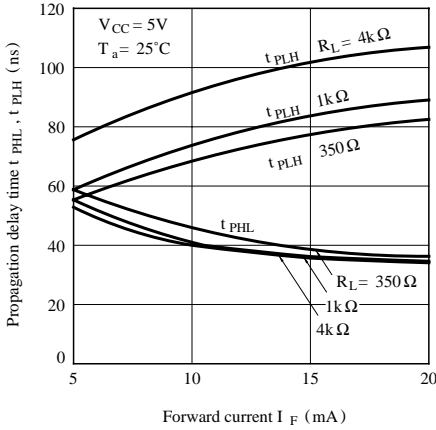
**Fig. 8-a Output Voltage vs. Forward Current**



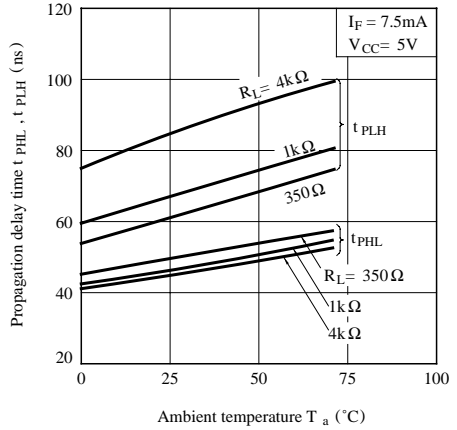
**Fig. 8-b Output Voltage vs. Forward Current (Ambient Temp. Characteristics)**



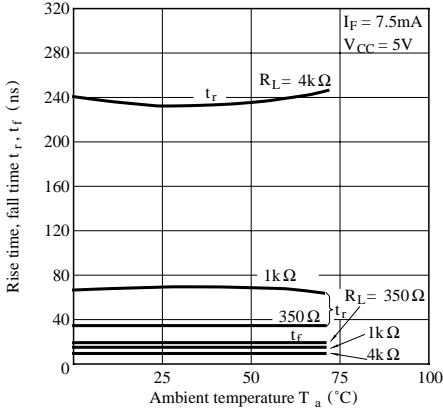
**Fig. 9 Propagation Delay Time vs. Forward Current**



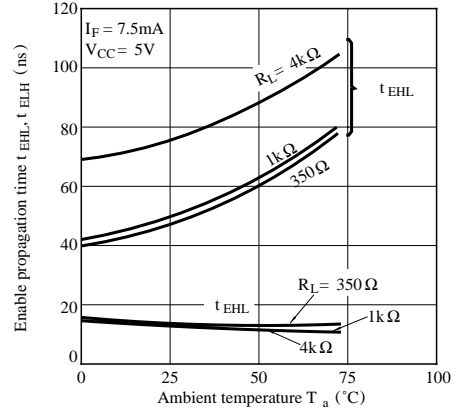
**Fig.10 Propagation Delay Time vs. Ambient Temperature**



**Fig.11 Rise Time, Fall Time vs. Ambient Temperature**



**Fig.12 Enable Propagation Time vs. Ambient Temperature**



**■ Precautions for Use**

- (1) Handle this product the same as with other integrated circuits against static electricity.
- (2) As for other general cautions, refer to the chapter "Precautions for Use"