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
   (Viso : 2 500V_{rms})
3. Low input current drive(I_{FHL} : MAX. 5mA)
4. Instantaneous common mode rejection
   voltage(CM_H : TYP. 500V/μs)
5. TTL and LSTTL compatible output
6. Recognized by UL, file No. E64380

■ Applications

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

■ Outline Dimensions   (Unit : mm)

① NC   ⑤ GND
② Anode   ⑥ V_O
③ Cathode   ⑦ V_E
④ NC   ⑧ V_{CC}
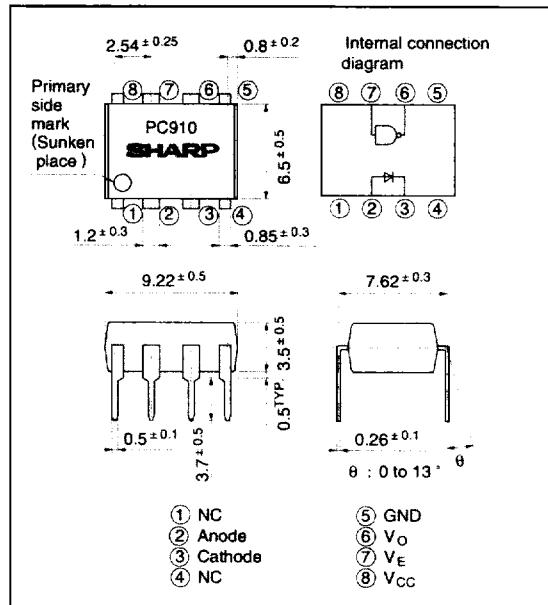
* "OPIC " (Optical IC) is a trademark of the SHARP Corporation.
An OPIC consists of a light-detecting element and signal-
processing circuit integrated onto a single chip.

■ 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_{rms}
	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℃)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_F	Ta = 25℃, I_F = 10mA	-	1.6	1.9	V
	Reverse current	I_R	Ta = 25℃, V_R = 5V	-	-	10	μA
	Terminal capacitance	C_t	Ta = 25℃, V = 0, f = 1MHz	-	60	150	pF
Output	High level output current	I_{OH}	V_{CC} = V_O = 5.5V, V_E = 2.0V, I_F = 250μA	-	2	250	μA
	Low level output voltage	V_{OL}	V_{CC} = 5.5V, V_E = 2.0V, I_F = 5mA, I_{OL} = 13mA	-	0.4	0.6	V
	High level enable current	I_{EH}	V_{CC} = 5.5V, V_E = 2.0V	-	- 0.8	- 1.8	mA
	Low level enable current	I_{EL}	V_{CC} = 5.5V, V_E = 0.5V	-	- 1.2	- 2.0	mA
	High level supply current	I_{CCH}	V_{CC} = 5.5V, I_F = 0, V_E = 0.5V	-	7	15	mA
	Low level supply current	I_{CCL}	V_{CC} = 5.5V, I_F = 10mA, V_E = 0.5V	-	13	18	mA
Transfer characteristics	"High→Low" threshold input current	I_{FHL}	V_{CC} = 5V, V_E = 2.0V V_O = 0.8V, R_L = 350Ω	-	2.5	5	mA
	Isolation resistance	R_{ISO}	Ta = 25℃, DC500V, 40 to 60% RH	5 x 10^10	10^10	-	Ω
	Floating capacitance	C_f	Ta = 25℃, V = 0, f = 1MHz	-	0.6	5	pF
	Response time — "High→Low" propagation delay time	t_{PHL}	Ta = 25℃, V_{CC} = 5V R_L = 350Ω, C_L = 15pF I_F = 7.5mA Fig. 1	-	50	120	ns
	Response time — "Low→High" propagation delay time	t_{PLH}		-	50	120	ns
	Response time — Rise time, Fall time	t_r, t_f		-	30	60	ns
	Response time — "High→Low" enable propagation delay time	t_{EHL}	Ta = 25℃, V_{CC} = 5V Fig. 2 R_L = 350Ω, C_L = 15pF I_F = 7.5mA, V_{EH} = 3V V_{EL} = 0.5V	-	15	50	ns
	Response time — "Low→High" enable propagation delay time	t_{ELH}		-	65	100	ns
	CMR — Instantaneous common mode rejection voltage "Output : High level"	CM_H	Ta = 25℃, V_{CC} = 5V, V_{CM} = 10V(peak) Fig. 3 R_L = 350Ω, I_F = 0, $V_{O(MIN)}$ = 2V	100	500	-	V/μs
	CMR — Instantaneous common mode rejection voltage "Output : Low level"	CM_L	Ta = 25℃, V_{CC} = 5V, V_{CM} = 10V(peak) Fig. 3 R_L = 350Ω, I_F = 5mA, $V_{O(MAX)}$ = 0.8V	- 100	- 500	-	V/μs

All typical values : at Ta = 25℃, V_{CC} = 5V

■ Recommended Operating Conditions

Parameter	Symbol	MIN.	MAX.	Unit
Low level input current	I_{FL}	0	250	μA
High level input current	I_{FH}	7	15	mA
High level enable voltage	V_{EH}	2.0	V_{CC}	V
Low level enable voltage	V_{EL}	0	0.8	V
Supply voltage	V_{CC}	4.5	5.5	V
Fanout (TTL load)	N	-	8	-
Operating temperature	T_{opr}	0	70	℃

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

Circuit Block Diagram
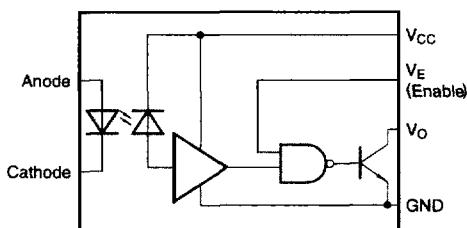
Truth Table

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.
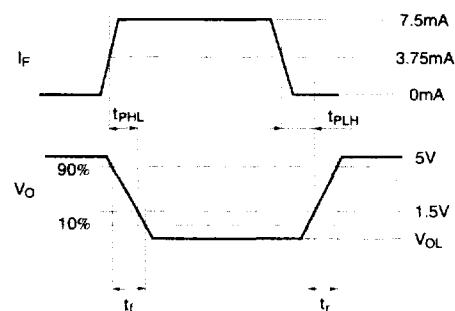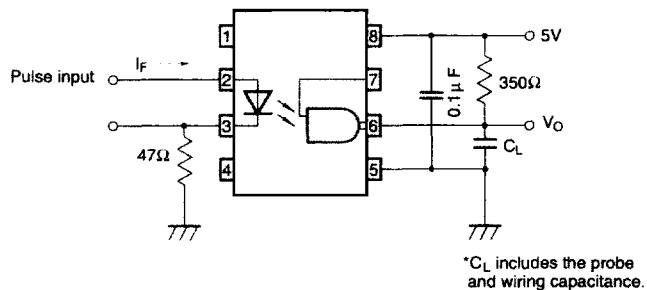
### Fig. 2 Test Circuit for t_{EHL} and t_{ELH}
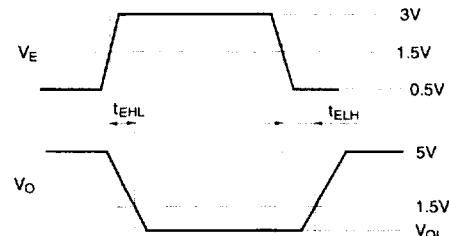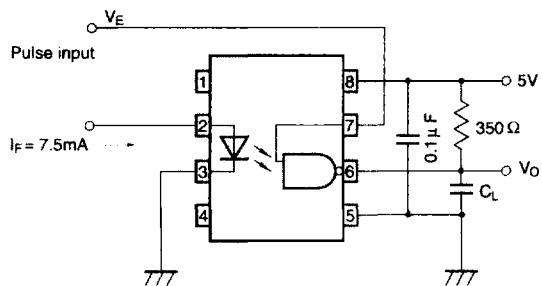
Fig. 3 Test Circuit for CM_H and CM_L

When the switch for infrared light emitting diode sets to A

When the switch for infrared light emitting diode sets to B
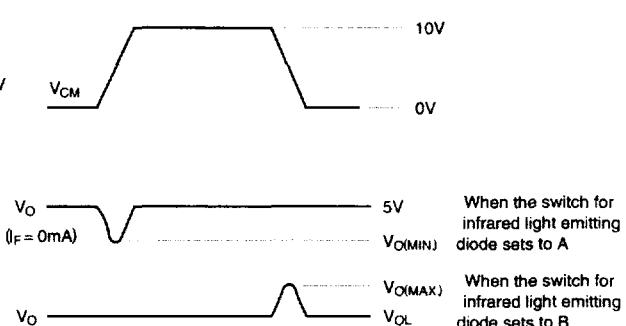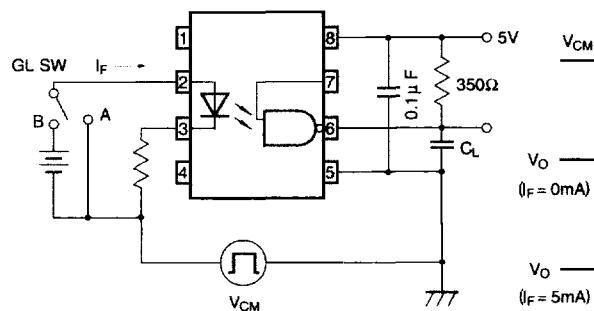
Fig. 4 Collector Power Dissipation vs. Ambient Temperature

Collector power dissipation P_C (mW)

Ambient temperature T_a (°C)

Fig. 5 Forward Current vs. Forward Voltage

Forward current I_F (mA)

T_a = 0°C
25°C
50°C
70°C

Forward voltage V_F (V)
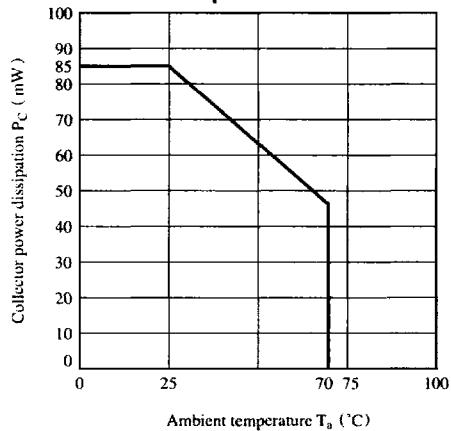
Fig. 6 High Level Output Current vs. Ambient Temperature

High level output current I_{OH} (μA)

I_F = 250μA
V_{CC} = 5.5V
V_O = 5.5V
V_E = 2V

Ambient temperature T_a (°C)
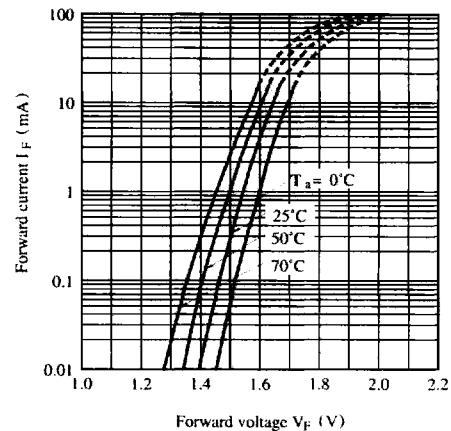
Fig. 7 Low Level Output Voltage vs. Ambient Temperature

Low level output voltage V_{OL} (V)

I_F = 5mA
V_{CC} = 5.5V
V_E = 2V

I_O = 16mA
12.8mA
9.6mA
6.4mA

Ambient temperature T_a (°C)

Fig. 8-a Output Voltage vs. Forward Current

Output voltage V_O (V)

V_{CC} = 5V
T_a = 25°C

R_L = 350Ω
1kΩ
4kΩ

Forward current I_F (mA)
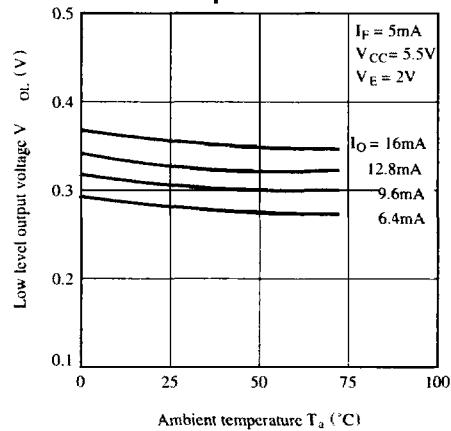
Fig. 8-b Output Voltage vs. Forward Current (Ambient Temp. Characteristics)

Output voltage V_O (V)

V_{CC} = 5V
T_a = 0 to 70°C

R_L = 350Ω
R_L = 1kΩ

Forward current I_F (mA)
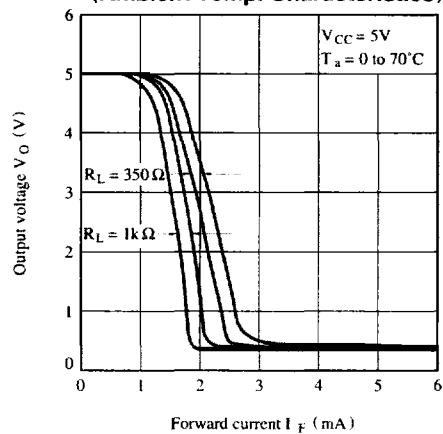
### Fig. 9 Propagation Delay Time vs. Forward Current
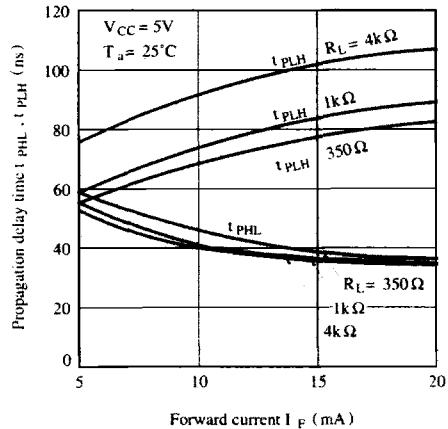
### Fig.10 Propagation Delay Time vs. Ambient Temperature
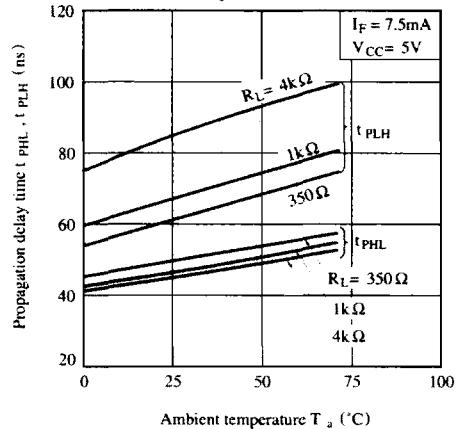
### Fig.11 Rise Time, Fall Time vs. Ambient Temperature
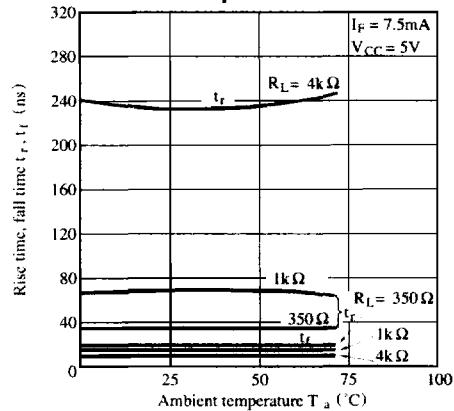
Fig.12 Enable Propagation Time vs. Ambient Temperature
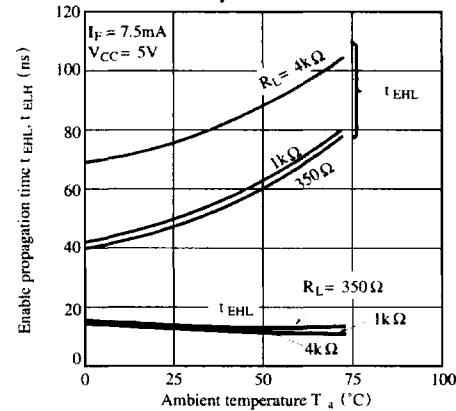
■ Precautions for Use

(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"