# PC902

## AC Input Type OPIC Photocoupler

### ■ Features

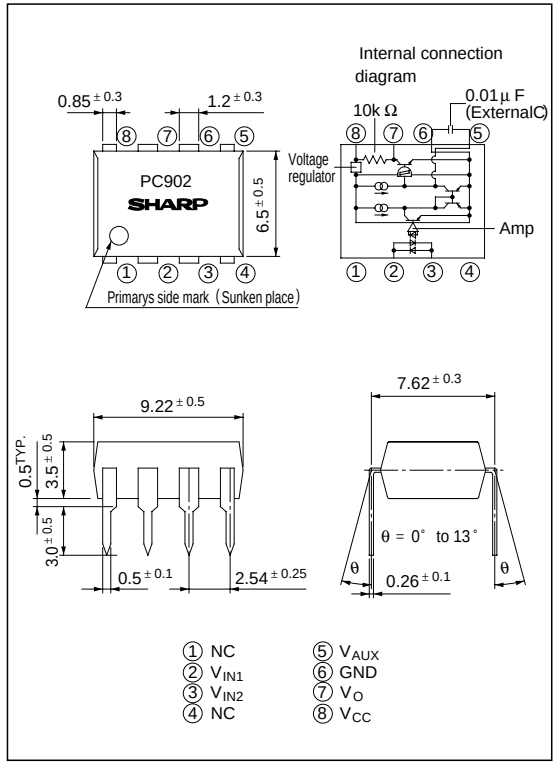
1. Capable of forming an integration circuit in conjunction with an external capacitor
2. AC input
3. High sensitivity
   ( $I_{FHL}$ : MAX. 2mA )
4. High isolation voltage between input and output
   ( $V_{iso}$ : 5 000V $_{rms}$ )
5. Standard dual-in-line package
6. Recognized by UL, file No. E64380

### ■ Applications

1. Programmable controllers
2. Telephone sets
3. AC line monitors

### ■ 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 | Forward current | $I_F$ | ± 20 | mA |
| | *1Peak forward current | $I_{FM}$ | ± 1 | A |
| | Power dissipation | P | 30 | mW |
| Output | Supply voltage | $V_{CC}$ | 15 | V |
| | Output voltage | $V_O$ | 15 | V |
| | Output current | $I_O$ | 16 | mA |
| | Power dissipation | $P_O$ | 150 | mW |
| Total power dissipation | | $P_{tot}$ | 170 | mW |
| *2Isolation voltage | | $V_{iso}$ | 5 000 | $V_{rms}$ |
| Operating temperature | | $T_{opr}$ | - 25 to + 85 | °C |
| Storage temperature | | $T_{stg}$ | - 55 to + 125 | °C |
| *3Soldering temperature | | $T_{sol}$ | 260 | °C |

*1 Pulse width<=100 μ s, Duty ratio : 0.001
*2 40 to 60% RH, AC for 1 minute
*3 For 10 seconds

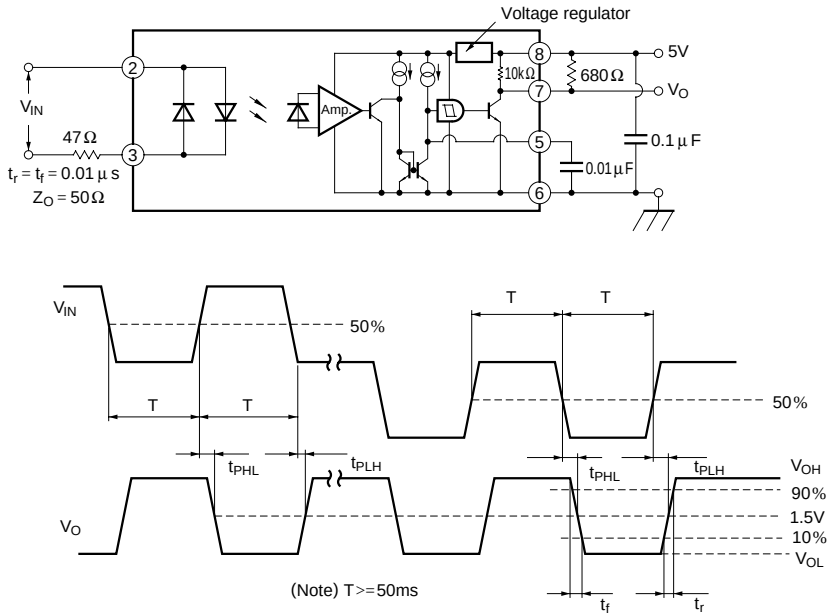
" In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest version of the device specification sheets before using any SHARP's device. "

## ■ Electro-optical Characteristics

(Ta = 0 to + 70˚C unless otherwise specified)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Input | Forward voltage | $V_F$ | $I_F$ = ± 20mA | - | - | 1.5 | V |
| | | | $I_F$ = ± 0.1mA | 0.55 | 0.95 | - | V |
| | Terminal capacitance | $C_t$ | $V_F$ = 0, f = 1kHz | - | 30 | 250 | pF |
| Output | Operating supply voltage | $V_{CC}$ | | 4.5 | - | 15 | V |
| | Low level output voltage | $V_{OL}$ | $I_{OL}$ = 8.0mA, $V_{CC}$ = 5V, $I_F$ = ± 2mA | - | 0.1 | 0.4 | V |
| | High level output voltage | $V_{OH}$ | $V_{CC}$ = 5V, $I_F$ = 0 | 3.5 | - | - | V |
| | Low level supply current | $I_{CCL}$ | $I_F$ = ± 2mA, $V_{CC}$ = 5V | - | 1.7 | 4.0 | mA |
| | High level supply current | $I_{CCH}$ | $V_{CC}$ = 5V, $I_F$ = 0 | - | 1.5 | 3.5 | mA |
| | AUX source current | $I_{AUX1}$ | Ta = 25˚C, $I_F$ = ± 2mA, $V_{CC}$ = 5V, $V_{AUX}$ = 1.3V | - 2 | - 3 | - 5 | µA |
| | AUX sink current | $I_{AUX2}$ | Ta = 25˚C, $I_F$ = 0, $V_{CC}$ = 5V, $V_{AUX}$ = 1.3V | 1.0 | 1.5 | 2.5 | µA |
| | AUX terminal voltage 1 | $V_{AUX1}$ | Ta = 25˚C, $I_F$ = 0, $V_{CC}$ = 5V | - | - | 0.2 | V |
| | AUX terminal voltage 2 | $V_{AUX2}$ | Ta = 25˚C, $I_F$ = ± 2mA, $V_{CC}$ = 5V | 2.3 | - | 2.8 | V |
| | "High→Low" threshold AUX voltage | $V_{AUXHL}$ | Ta = 25˚C, $I_F$ = 0, $V_{CC}$ = 5V | 2.05 | - | 2.55 | V |
| | "Low→High" threshold AUX voltage | $V_{AUXLH}$ | Ta = 25˚C, $I_F$ = 0, $V_{CC}$ = 5V | 0.75 | - | 1.10 | V |
| Transfer characteristics | "High→Low" threshold input current 1 | $I_{FHL1}$ | Ta = 25˚C, $V_{CC}$ = 5V, $R_L$ = 680Ω | - | 0.7 | 1.5 | mA |
| | | | $V_{CC}$ = 5V, $R_L$ = 680Ω | 0.1 | - | 2.0 | mA |
| | "High→Low" threshold input current 2 | $I_{FHL2}$ | Ta = 25˚C, $V_{CC}$ = 5V, $R_L$ = 680Ω | - | - 0.7 | - 1.5 | mA |
| | | | $V_{CC}$ = 5V, $R_L$ = 680Ω | - 0.1 | - | - 2.0 | mA |
| | Isolation resistance | $R_{ISO}$ | Ta = 25˚C, DC500V, 40 to 60% RH | 5 x $10^{10}$ | $10^{11}$ | - | Ω |
| | Floating capacitance | $C_f$ | Ta = 25˚C, V = 0, f = 1MHz | - | 0.6 | 5 | pF |
| | *4Response time "High→Low" propagation delay time | $t_{PHL}$ | Ta = 25˚C, $I_F$ = ± 2mA, $V_{CC}$ = 5V, $C_{AUX}$ = 0.01 µF, $R_L$ = 680Ω | 4.5 | 7.0 | 10 | ms |
| | *4Response time "Low→High" propagation delay time | $t_{PLH}$ | | 6.5 | 10.5 | 15 | ms |
| | *4Response time Fall time | $t_f$ | | - | 0.05 | 0.5 | µs |
| | *4Response time Rise time | $t_r$ | | - | 0.1 | 0.5 | µs |
| | *5Instantaneous common mode rejection voltage "Output : High level" | $CM_H$ | Ta = 25˚C, $I_F$ = 0, $V_{CM}$ = 600V (peak), $V_{O(MIN.)}$ = 2V, $R_L$ = 680Ω, $C_{AUX}$ = 0.01 µF | - | 2 000 | - | V/µs |
| | *5PInstantaneous common mode rejection voltage "Output : Low level" | $CM_L$ | Ta = 25˚C, $I_F$ = ± 2mA, $V_{CM}$ = 600V (peak), $V_{O(MAX.)}$ = 0.8V, $R_L$ = 680Ω, $C_{AUX}$ = 0.01 µF | - | - 2 000 | - | V/µs |

## ❋ 4 Test Circuit for Response Time




## ❋ 5 Test Circuit for Instantaneous Common Mode Rejection Voltage

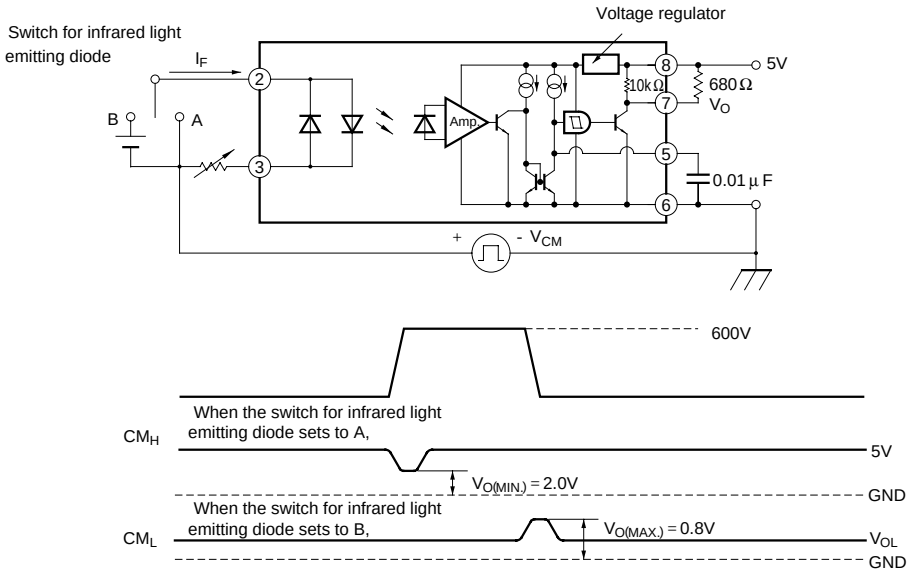


**Fig. 1 Forward Current vs. Ambient Temperature**

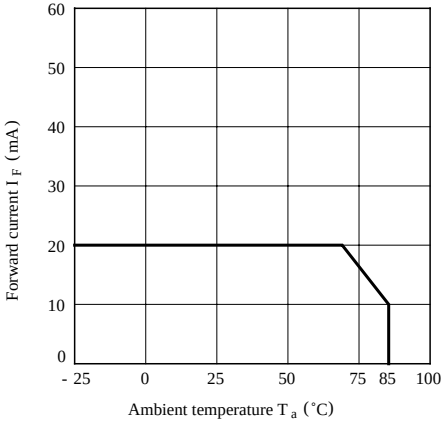



**Fig. 2 Power Dissipation vs. Ambient Temperature**

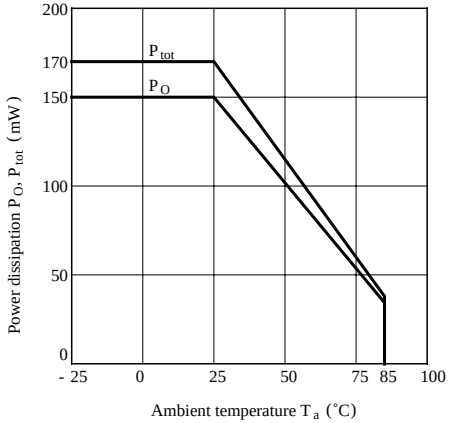



**Fig. 3 Forward Current vs. Forward Voltage**

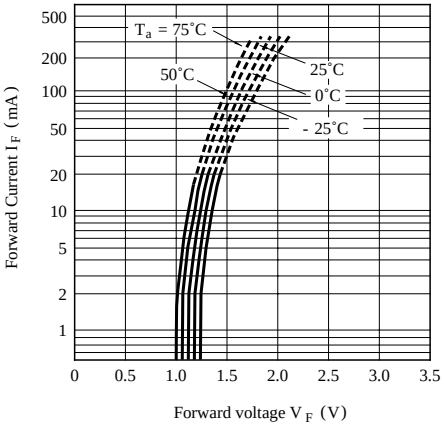
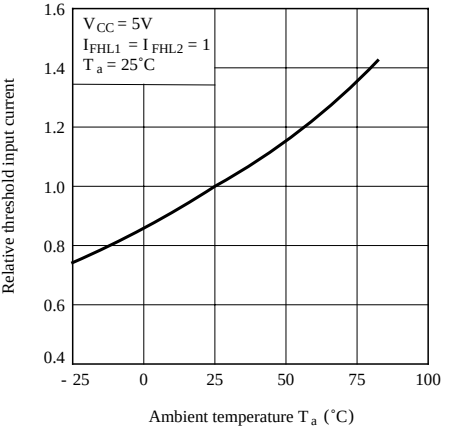
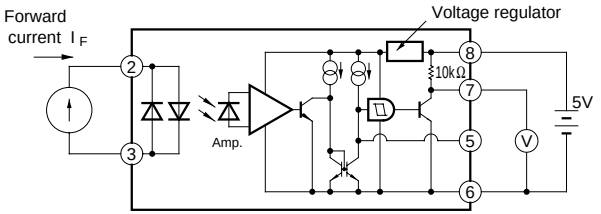



**Fig. 4 Relative Threshold Input Current vs. Ambient Temperature**




**Test Circuit For Threshold Input Current vs. Ambient Temperature**




$I_{FHL1}$, $I_{FHL2}$ represents forward current when output goes from high to low. $I_{FHL1}$ is a forward current flowing into pin ② while $I_{FHL2}$ is one flowing out of pin ② .

**Fig. 5 Low Level Output Voltage vs. Low Level Output Current**

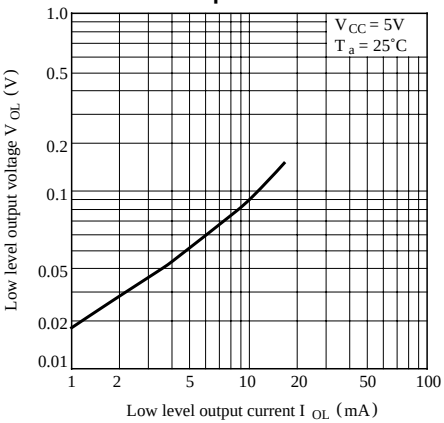



**Fig. 6 Low Level Output Voltage vs. Ambient Temperature**

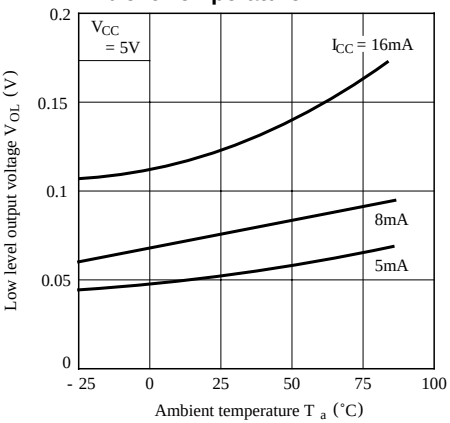



**Fig. 7 Supply Current vs. Supply Voltage**

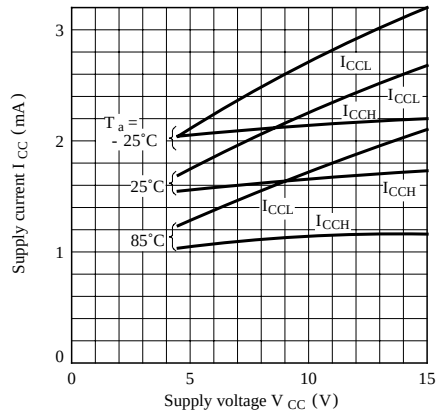



**Fig. 8 AUX Current vs. Forward Current**

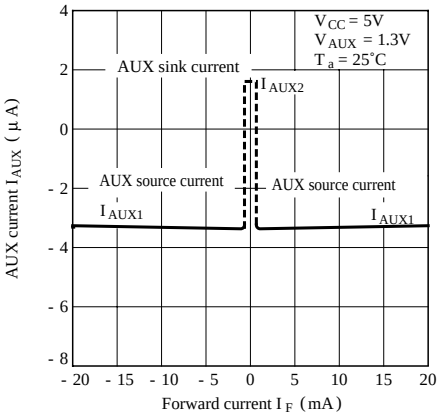
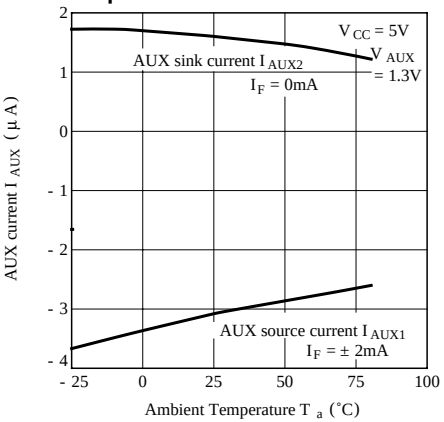
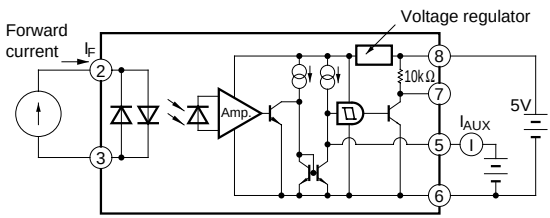



**Fig. 9 AUX Current vs. Ambient Temperature**




**Test Circuit for AUX**




{ + : Current flowed from ② terminal
{ - : Current flowed out to ② terminal

**Fig.10 AUX Terminal Voltage vs. Ambient Temperature**

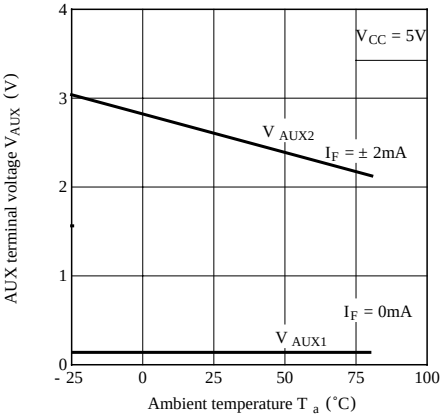



**Fig.10 Threshold AUX Voltage vs. Ambient Temperature**

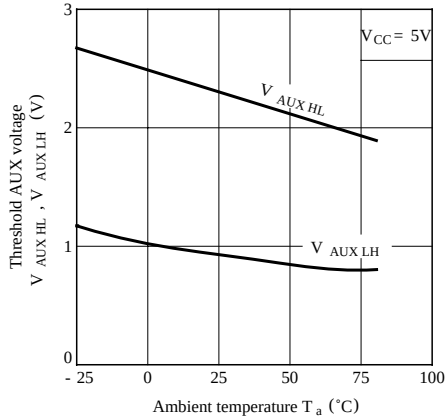



**Fig.12 Propagation Delay Time vs. Forward Current**

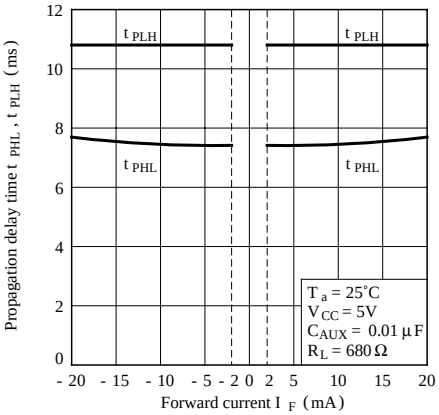
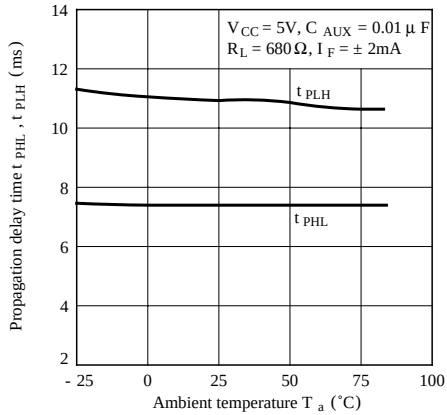
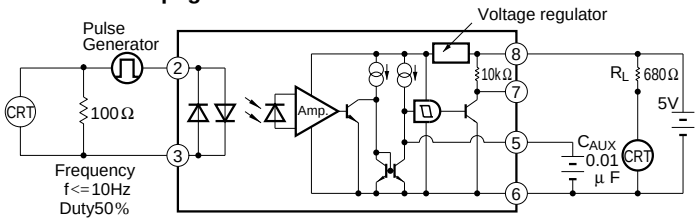



**Fig.13 Propagation Delay Time vs. Ambient Temperature**




**Test Circuit for Propagation Time**




## ■ Precautions for Use

(1) It is recommended that a by-pass capacitor of more than 0.01 µ F is added between $V_{CC}$ and GND near the device in order to stabilize power supply line.

(2) Handle this product the same as with other integrated circuits against static electricity.

(3) As for other general cautions, please refer to the chapter "Precautions for Use"