# PC910L0NSZ

## Ultra-High Speed Response *OPIC Photocoupler

* VDE (VDE0884) approved type is also available us an option

## ■ Features

1. Ultra-high speed response
   ($t_{PHL}$, $t_{PLH}$: TYP. 50ns at $R_L$=350Ω)
2. Isolation voltage between input and output
   ($V_{iso\ (rms)}$: 5.0kV)
3. Low input current drive ($I_{FHL}$: MAX. 5mA)
4. Instantaneous common mode rejection voltage ($CM_H$: TYP. 20kV/μs)
5. TTL and LSTTL compatible output
6. Recognized by UL, file No. E64380 (model No. PC910L)

## ■ Applications

1. High speed interfaces for computer peripherals
2. Programmable controllers
3. Inverters

## ■ Absolute Maximum Ratings

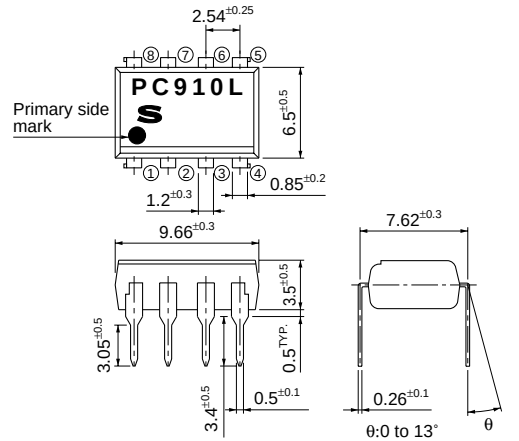
($T_a$=25°C)

| | Parameter | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input | *1 Forward current | $I_F$ | 20 | mA |
| | Reverse voltage | $V_R$ | 5 | V |
| | Power dissipation | P | 40 | mW |
| Output | Supply voltage | $V_{CC}$ | 7 | V |
| | *2 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 |
| *3 Isolation voltage | | $V_{iso\ (rms)}$ | 5.0 | kV |
| Operating temperature | | $T_{opr}$ | −40 to +85 | °C |
| Storage temperature | | $T_{stg}$ | −55 to +125 | °C |
| *4 Soldering temperature | | $T_{sol}$ | 270 | °C |

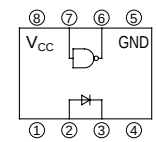
*1 $T_a$=$T_{opr}$
*2 Shall not exceed 500mV from supply voltage ($V_{CC}$)
*3 40 to 60%RH, AC for 1minute
*4 For 10s

## ■ Outline Dimensions

(Unit : mm)




Internal connection diagram




① NC ⑤ GND
② Anode ⑥ $V_O$ (Open collector)
③ Cathode ⑦ NC
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.

## ■ Electro-optical Characteristics

(Unspecified $T_a$=–40 to +85˚C, All typical values at $T_a$ =25˚C, $V_{CC}$=5V)

| Parameter | | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_F$ | $T_a$=25˚C, $I_F$=10mA | – | 1.6 | 1.9 | V |
| | Reverse current | | $I_R$ | $T_a$=25˚C, $V_R$=5V | – | – | 10 | μA |
| | Terminal capacitance | | $C_t$ | $T_a$=25˚C, V=0, f=1kHz | – | 60 | 150 | pF |
| Output | High level output voltage | | $I_{OH}$ | $V_{CC}$=$V_O$=5.5V, $V_E$=2.0V, $I_F$=250μA | – | 0.02 | 100 | μA |
| | Low level output voltage | | $V_{OL}$ | $V_{CC}$=5.5V, $V_O$=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 | – | –0.5 | –1.6 | mA |
| | Low level enable current | | $I_{EL}$ | $V_{CC}$=5.5V, $V_E$=0.5V | – | –0.7 | –1.6 | mA |
| | High level supply current | | $I_{CCH}$ | $V_{CC}$=5.5V, $I_F$=0,$V_E$=2V | – | 5 | 10 | mA |
| | | | | $V_{CC}$=5.5V, $I_F$=0,$V_E$=0.5V | – | 5 | – | mA |
| | Low level supply current | | $I_{CCL}$ | $V_{CC}$=5.5V, $I_F$=10mA,$V_E$=2V | – | 7 | 13 | mA |
| | | | | $V_{CC}$=5.5V, $I_F$=10mA,$V_E$=0.5V | – | 5.5 | – | 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 | | $R_{ISO}$ | $T_a$=25˚C, DC=500V, 40 to 60%RH | $5\times10^{10}$ | $10^{11}$ | – | Ω |
| | Floating capacitance | | $C_f$ | $T_a$=25˚C, V=0, f=1MHz | – | 0.6 | 5 | pF |
| | Response time | "High→Low" propagation time | $t_{PHL}$ | Fig. 1 $T_a$=25˚C, $V_{CC}$=5V, $R_L$=350Ω, $C_L$=15pF, $I_F$=7.5mA | 25 | 48 | 75 | ns |
| | | "Low→High" propagation time | $t_{PLH}$ | | 25 | 50 | 75 | ns |
| | | Rise time | $t_r$ | | – | 10 | – | ns |
| | | Fall time | $t_f$ | | – | 20 | – | ns |
| | | *7 Distortion of pulse width | $\Delta t_w$ | | – | – | 35 | ns |
| | | "High→Low" enable propagation delay time | $t_{EHL}$ | Fig.2 $T_a$=25˚C, $V_{CC}$=5V, $R_L$=350Ω, $C_L$=15pF, $I_F$=7.5mA, $V_{EH}$=3V, $V_{EL}$=0.5V | – | 15 | – | ns |
| | | "Low→High" enable propagation delay time | $t_{ELH}$ | | – | 10 | – | ns |
| | CMR | Instantaneous common mode rejection voltage "Output : High level" | $CM_H$ | Fig.3 $T_a$=25˚C, $V_{CC}$=5V, $V_{CM}$=1kV(P-P), $R_L$=350Ω, $I_F$=0, $V_{O\,(Min)}$=2V | 10 | 20 | – | kV/μs |
| | | Instantaneous common mode rejection voltage "Output : Low level" | $CM_L$ | Fig.3 $T_a$=25˚C, $V_{CC}$=5V, $V_{CM}$=1kV(P-P), $R_L$=350Ω, $I_F$=5mA, $V_{O\,(Max)}$=0.8V | –10 | –20 | – | kV/μs |

*6 It shall connect a by-pass capacitor of 0.01μF or more between $V_{CC}$ (Pin ⑧) and GND (Pin ⑤) near the device, when it measures the transfer characteristics and the output side characteristics

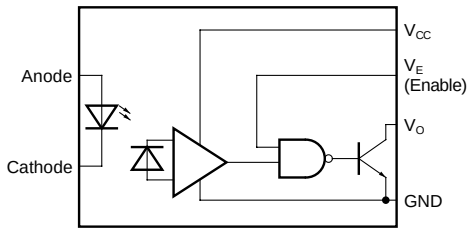
*7 Distortion of pulse width $\Delta t_w = | t_{PHL} - t_{PLH} |$

## ■ Recommended Operating Conditions

| Parameter | Symbol | MIN. | MAX. | Unit |
|---|---|---|---|---|
| Low level input current | $I_{FL}$ | 0 | 250 | μA |
| High level input current | $I_{FH}$ | 8 | 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 | $T_{opr}$ | –40 | 85 | ˚C |

1. When the enable input is in high level state, extemal pull-up resistor is unnecessary

## ■ Circuit Block Diagram

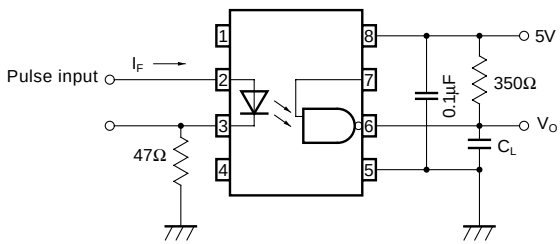



## ■ Truth Table

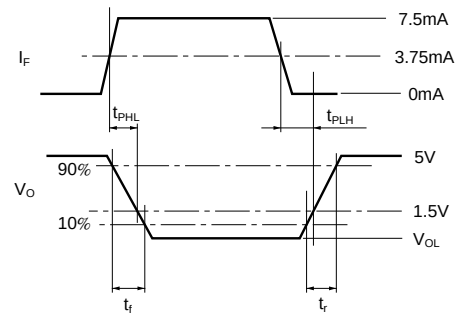
| Input | Enable | Output |
|---|---|---|
| H | H | L |
| L | H | H |
| H | L | H |
| L | L | H |

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

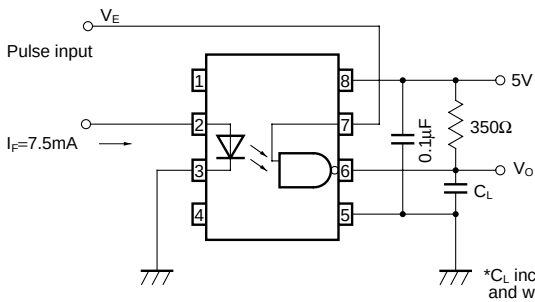
### Fig.1 Test Circuit for $t_{PHL}$, $t_{PLH}$, $t_r$ and $t_f$



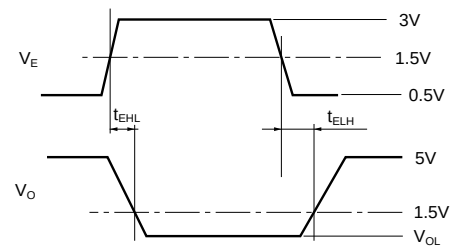

*$C_L$ includes the probe and wiring capacitance.



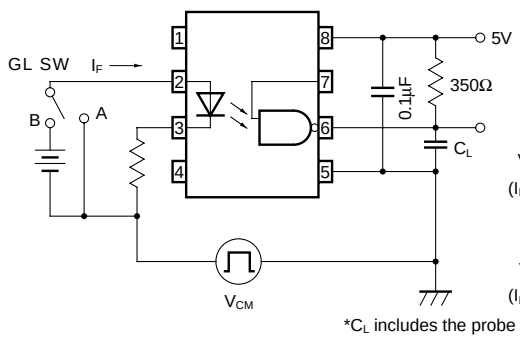

### Fig.2 Test Circuit for $t_{EHL}$ and $t_{ELH}$

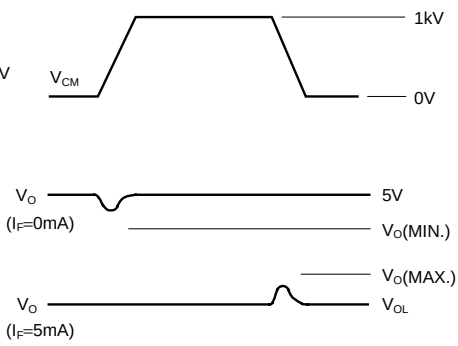



*$C_L$ includes the probe and wiring capacitance.



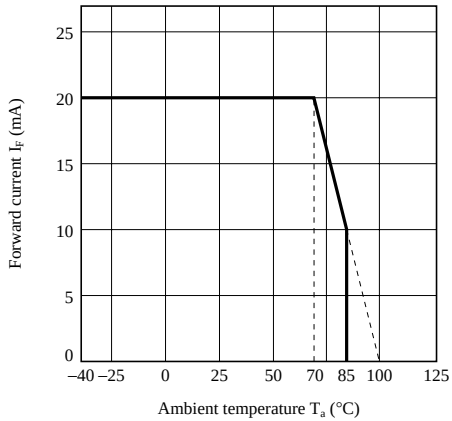

### Fig.3 Test Circuit for $CM_H$ and $CM_L$



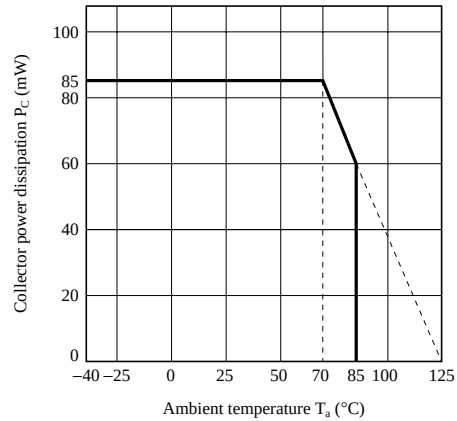




*$C_L$ includes the probe and wiring capacitance.

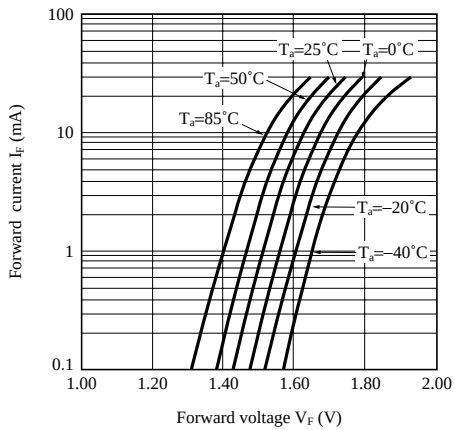
## Fig.4 Forward Current vs. Ambient Temperature



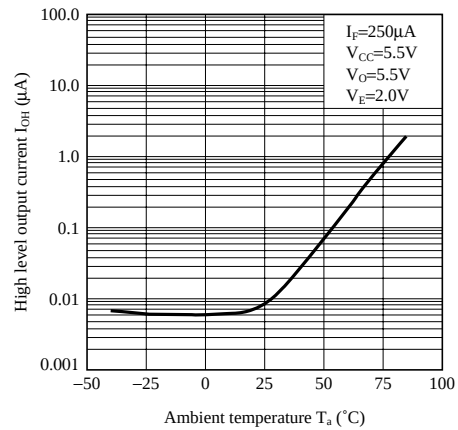

## Fig.5 Collector Power Dissipation vs. Ambient Temperature



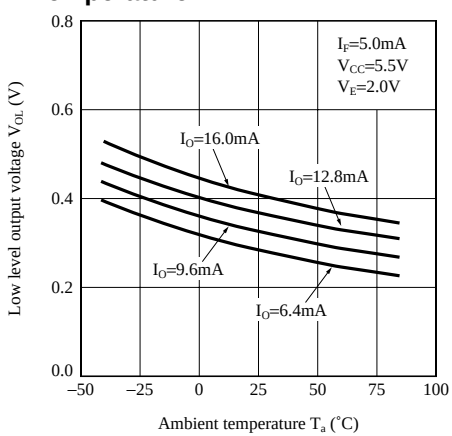

## Fig.6 Forward Current vs. Forward Voltage



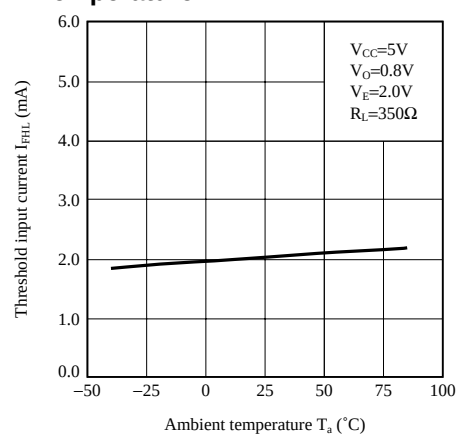

## Fig.7 High Level Output Current vs. Ambient Temperature



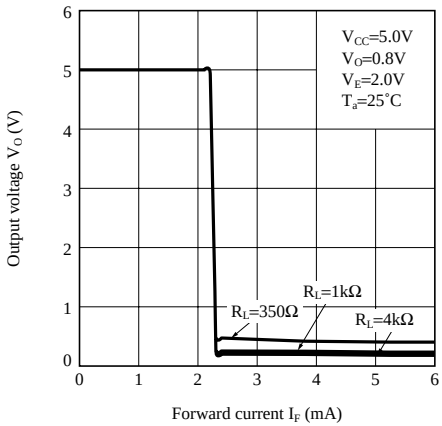

## Fig.8 Low Level Output Voltage vs. Ambient Temperature



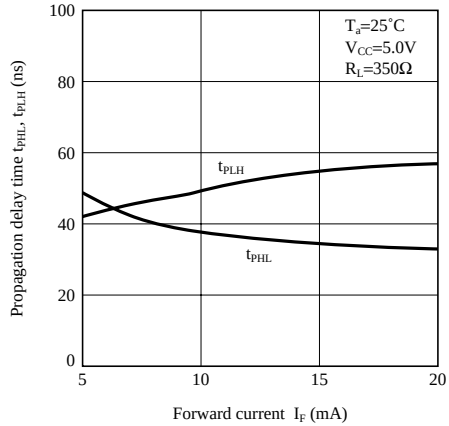

## Fig.9 Threshold Input Current vs. Ambient Temperature



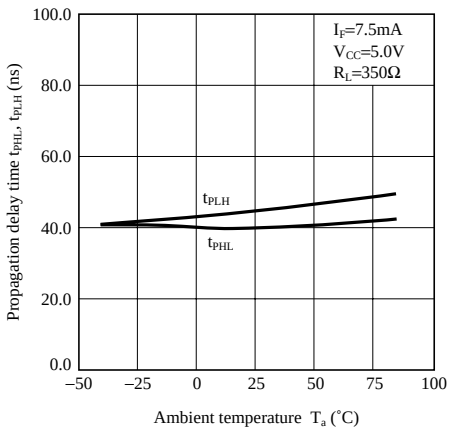
## Fig.10 Output Voltage vs. Forward Current




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




## Fig.12 Propagation Delay Time vs. Ambient Temperature



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