

PC410L0NIP

High Speed Response, High CMR OPIC Photocoupler

■ Features

1. High resistance to noise due to high common rejection voltage (CMR:MIN. 10kV/ μ 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

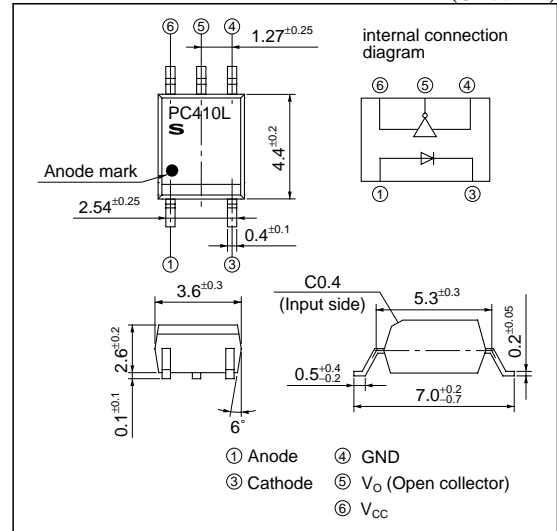
*2 Refer to Fig.5

*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°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 | μA | | |
| | Terminal capacitance | C_t | $T_a = 25^\circ\text{C}$, $V = 0$, $f = 1\text{MHz}$ | – | 60 | 150 | 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 | μA | | |
| | Low level supply current | I_{CCL} | $V_{CC} = 5.5\text{V}$, $I_F = 10\text{mA}$ | – | 7 | 13 | mA | | |
| | High level supply current | I_{CCH} | $V_{CC} = 5.5\text{V}$, $I_F = 0$ | – | 5 | 10 | 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 | mA | | |
| | Isolation resistance | R_{ISO} | $T_a = 25^\circ\text{C}$, $\text{DC} = 500\text{V}$, 40 to 60% RH | 5×10^{10} | 1×10^{11} | – | Ω | | |
| Floating capacitance | | C_f | $T_a = 25^\circ\text{C}$, $V = 0$, $f = 1\text{MHz}$ | – | 0.6 | – | 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 | Δt_W | | | – | – | 35 | ns |
| | CMR | Instantaneous common mode rejection voltage "Output : High level" | CM_{FH} | | | $I_F = 0$ $V_{O(\text{Min})} = 2\text{V}$ | $T_a = 25^\circ\text{C}$ $V_{CC} = 5\text{V}$ $V_{CM} = 1\text{kV(P-P)}$ $R_L = 350\Omega$ | 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 | – | | kV/ μs | |

(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 | μA |
| High level input current | I_{FH} | 8 | 15 | 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 μF) between V_{CC} and GND at the position within 1cm from lead pin

Fig.1 Block Diagram

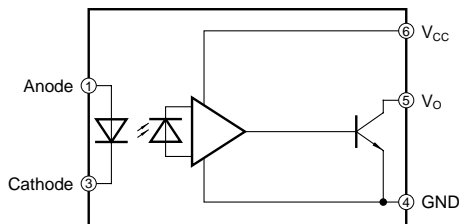


Fig.2 Test Circuit for t_{PHL} , t_{PLH} , t_r and t_f

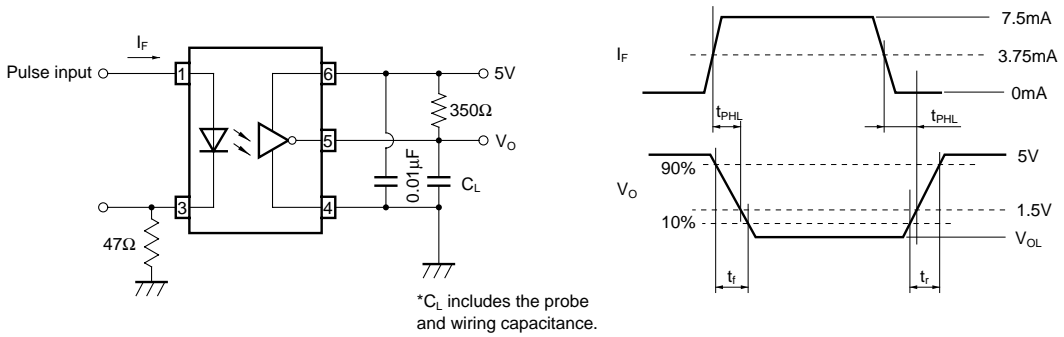


Fig.3 Test Circuit for Common Mode Rejection Voltage

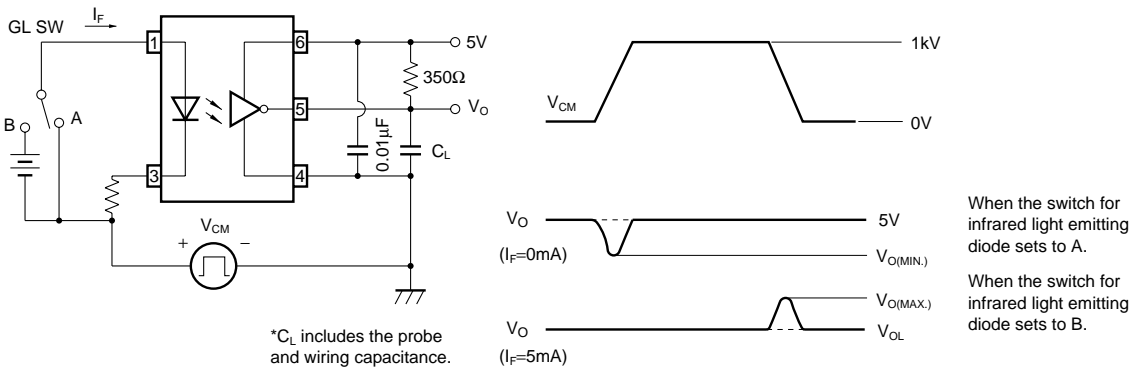


Fig.4 Forward Current vs. Ambient Temperature

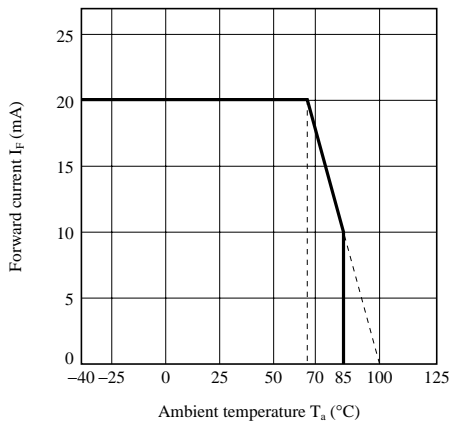


Fig.5 Collector Power Dissipation vs. Ambient Temperature

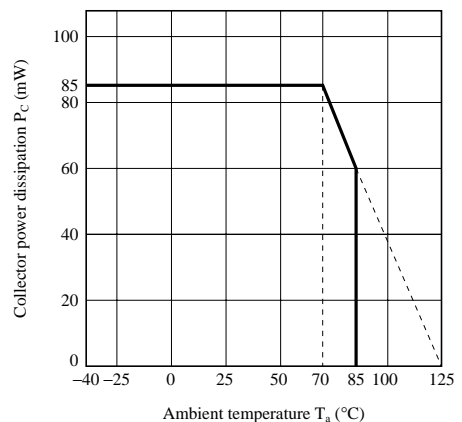


Fig.6 Forward Current vs. Forward Voltage

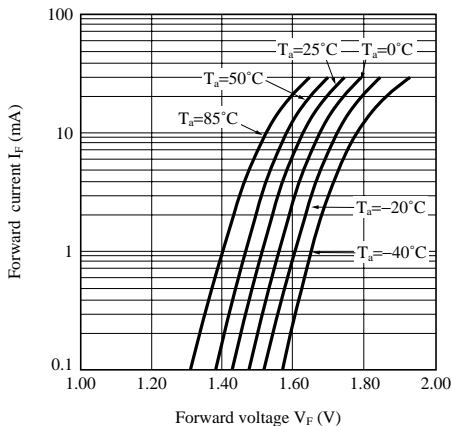


Fig.7 High Level Output Current vs. Ambient Temperature

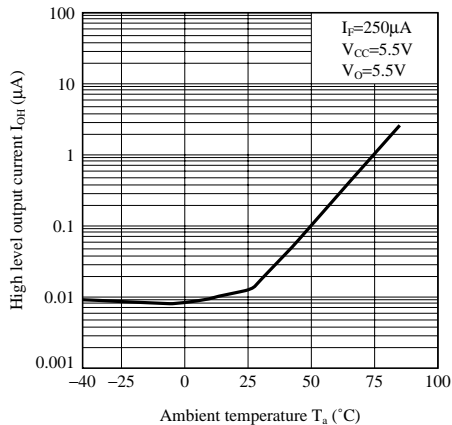


Fig.8 Low Level Output Voltage vs. Ambient Temperature

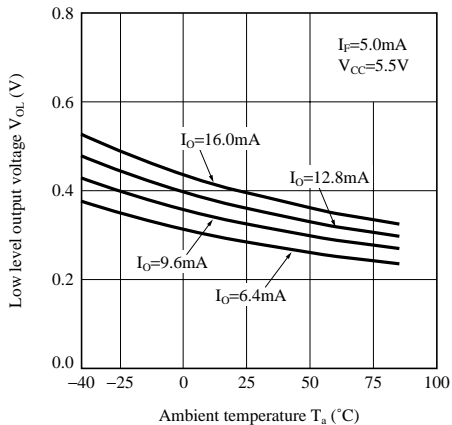


Fig.9 Output Voltage vs. Forward Current

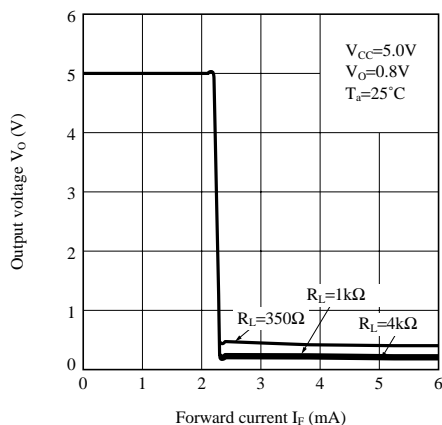


Fig.10 Threshold Input Current vs. Ambient Temperature

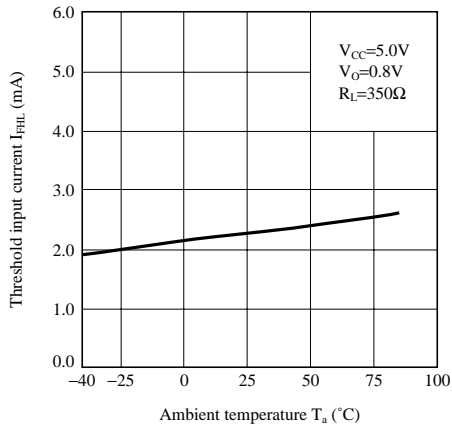


Fig.11 Propagation Delay Time vs. Forward Current

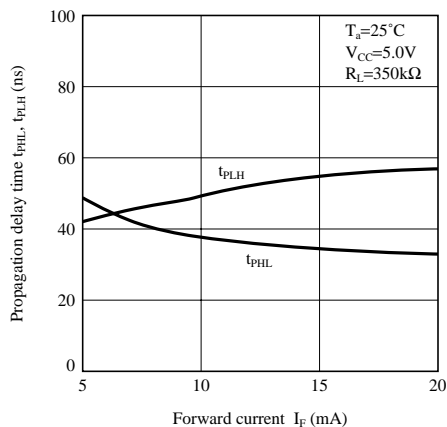
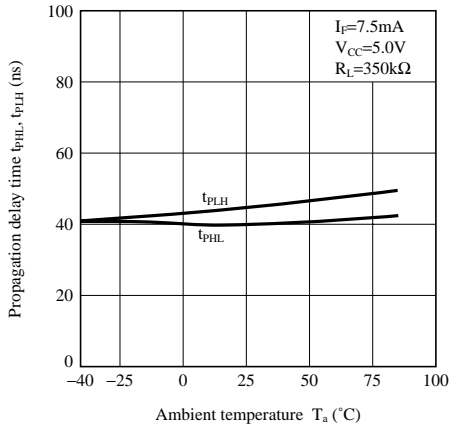


Fig.12 Propagation Delay Time vs. Ambient Temperature



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