PC9D10

## Ultra-high Speed Response, 2-channel OPIC Photocoupler

■ Features

1. Built-in 2-channel
2. Ultra-high speed response
   (t_{PHL} , t_{PLH} : TYP. 50ns at R_L= 350Ω)
3. Isolation voltage between input and output
   (V_{ISO} : 2 500V_{rms})
4. Low input current drive (I_{FHL} : MAX. 5mA)
5. Instantaneous common mode rejection
   voltage (CM$_H$: TYP. 500V/μ s)
6. Recognized by UL. file No. 64380

■ Applications

1. Computer perpherals high speed interface
   for microcomputer systems
2. High speed line recievers
3. Digital audio equipment
4. Interface with various data transfer equipment

■ Outline Dimensions   (Unit : mm)

① ④ Anode   ⑥ V$_{02}$
② ③ Cathode   ⑦ V$_{01}$
⑤ GND   ⑧ V$_{CC}$

*Output sides are open collector.
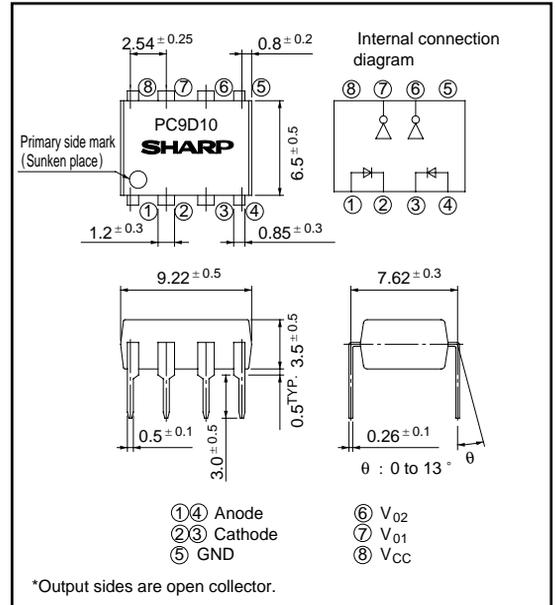
* " OPIC " (Optical IC) is a trademark of the SHARP Corporation.
An OPIC consists of a light-detecting element and signal-
processing circuit integrated onto a single chip.

■ Absoulte Maximum Ratings   (Ta= 25˚C)

	Parameter	Symbol	Rating	Unit
Input	[1][2]Forward current	I_F	15	mA
	[2]Reverse voltage	V_R	5	V
	[1][2]Power dissipation	P	40	mW
Output	[3]Supply voltage	V_{CC}	7	V
	[2]High level output voltage	V_{OH}	7	V
	[2]Low level output current	I_{OL}	16	mA
	Collector power dissipation	P_C	60	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] Each channel
[3] For 1 minute max.
[4] AC for 1 minute, 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] 2mm or more away from the lead base for 10 seconds or less

■ Electro-optical Characteristics

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

		Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input		Forward voltage	V_F	Ta = 25°C, I_F = 10mA	-	1.6	1.75	V
		Reverse current	I_R	Ta = 25°C, V_R = 5V	-	-	10	μA
		Terminal capacitance	C_t	Ta = 25°C, V = 0, f = 1MHz	-	60	250	pF
Output		High level output current	I_{OH}	V_{CC} = V_O = 5.5V, I_F = 250μA	-	2	250	μA
		Low level output voltage	V_{OL}	V_{CC} = 5.5V, I_F = 5mA, I_{OL} = 13mA	-	0.4	0.6	V
		High level supply current	I_{CCH}	V_{CC} = 5.5V, I_F = 0	-	14	30	mA
		Low level supply current	I_{CCL}	V_{CC} = 5.5V, I_F = 10mA	-	26	36	mA
Transfer characteristics		" High→Low " threshold input current	I_{FHL}	V_{CC} = 5V, V_O = 0.8V, R_L = 350Ω	-	2.5	5	mA
		Isolation resistance	R_{ISO}	Ta = 25°C, DC500V, 40 to 60% RH	5×10^{10}	10^{11}	-	Ω
		Floating capacitance	C_f	Ta = 25°C, V = 0, f = 1MHz	-	0.6	-	pF
	Response time	" High→Low " propagation delay time	t_{PHL}	Ta = 25°C, V_{CC} = 5V Fig. 1	-	50	75	ns
		" Low→High " propagation delay time	t_{PLH}	R_L = 350Ω , C_L = 15pF	-	50	75	ns
		Rise time, Fall time	t_r , t_f	I_F = 7.5mA	-	30	60	ns
	CMR	Instantaneous common mode rejection voltage " High level output "	CM_H	Ta = 25°C, V_{CC} = 5V, $V_{O(MIN)}$ = 2V Fig. 2 V_{CM} = 10V, R_L = 350Ω, I_F = 0	100	500	-	V/μs
		Instantaneous common mode rejection voltage " Low level output "	CM_L	Ta = 25°C, V_{CC} = 5V, $V_{O(MAX)}$ = 0.8V Fig. 2 V_{CM} = 10V, R_L = 350Ω, I_F = 5mA	- 100	- 500	-	V/μs

All typical values : at Ta = 25°C, 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
Supply voltage	V_{CC}	4.5	5.5	V
Fanout (TTL load)	N	-	8	-
Operating temperature	T_{opr}	0	70	°C

Connect a ceramic by-pass capacitor (0.01 to 0.1μF) between
V_{CC} and GND at the position within 1cm from pin.

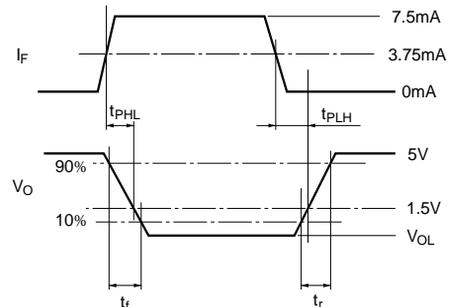## Fig. 1 Test Circuit for t_{PHL}, t_{PLH}, t_r and t_f

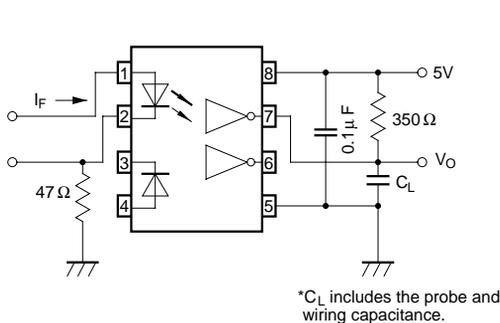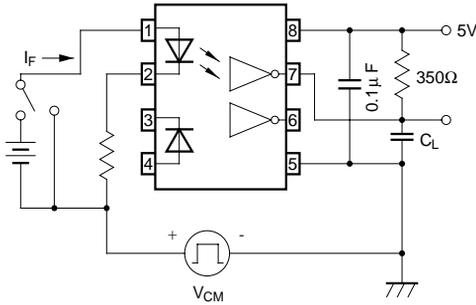*C_L includes the probe and wiring capacitance.

Fig. 2 Test Circuit for CM$_H$ and CM$_L$
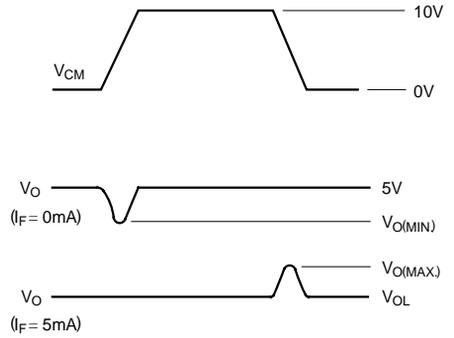
Fig. 3 Collector Power Dissipation vs. Ambient Temperature

Collector power dissipation P$_C$ (mW)

Ambient temperature T$_a$ (°C)
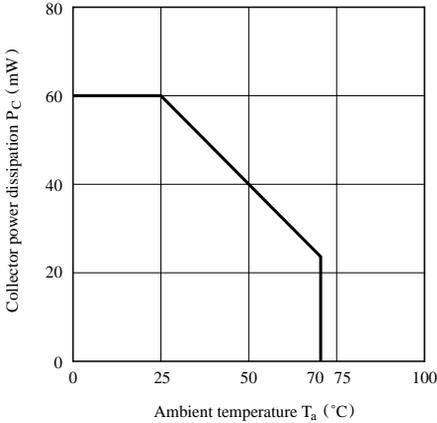
Fig. 4 Forward Current vs. Forward Voltage

Forward current I$_F$ (mA)

T$_a$ = 75°C
50°C
25°C
0°C

Forward voltage V$_F$ (V)
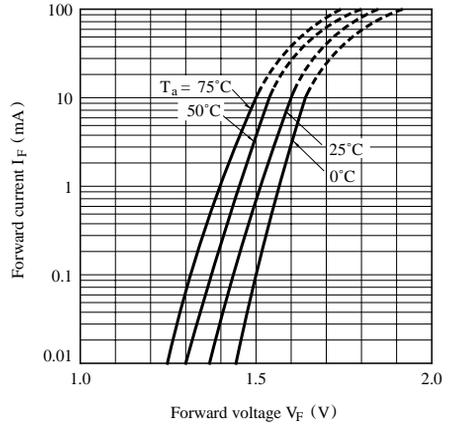
Fig. 5 High Level Output Current vs. Ambient Temperature

High level output current I$_{OH}$ (µA)

I$_F$ = 250 µA
V$_{CC}$ = 5.5V
V$_O$ = 5.5V

Ambient temperature T$_a$ (°C)
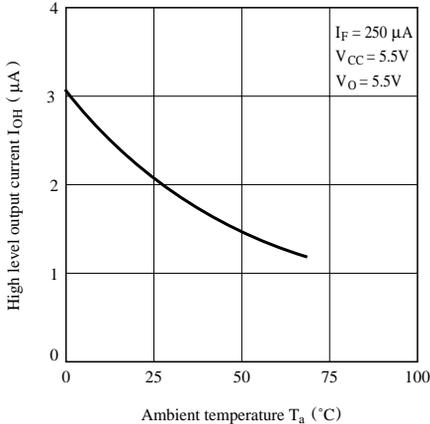
Fig. 6 Low Level Output Voltage vs. Ambient Temperature

Low level output voltage V$_{OL}$ (V)

I$_F$ = 5mA
V$_{CC}$ = 5.5V

I$_O$ = 16mA
12.8mA
9.6mA
6.4mA

Ambient temperature T$_a$ (°C)

Fig. 7-a Output Voltage vs. Forward Current

Output current V_O (V)

$V_{CC} = 5V$
$T_a = 25°C$

$R_L = 350 \Omega$
$1k\Omega$
$4k\Omega$
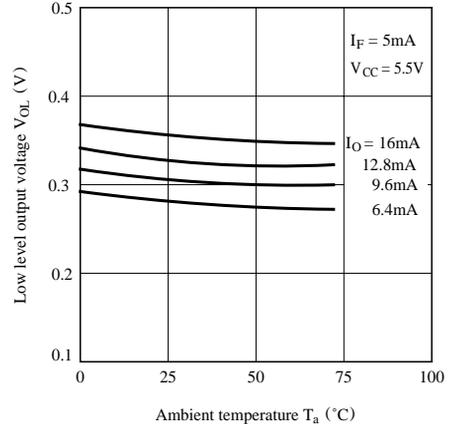
Forward current I_F (mA)
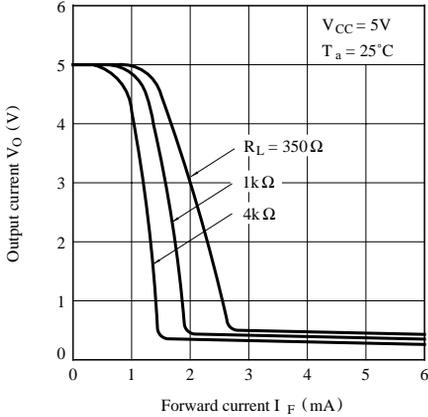
Fig. 7-b Output Voltage vs. Forward Current
（Ambient Temp. Characteristics ）

Output Voltage V_O (V)

$V_{CC} = 5V$
$T_a = 0$ to $70°C$

$R_L = 350 \Omega$
$R_L = 1k\Omega$

Forward current I_F (mA)
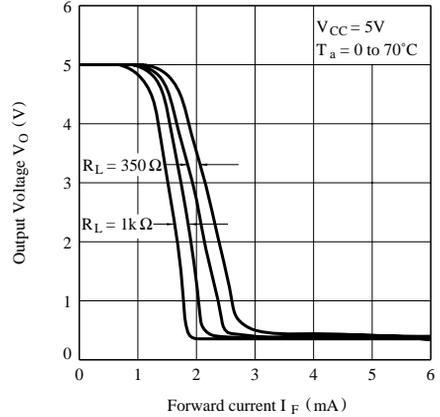
Fig. 8 Propagation Delay Time vs.
Forward Current

Propagation delay time t_{PHL}, t_{PLH} (ns)

$V_{CC} = 5V$, $T_a = 25°C$

t_{PLH} $R_L = 4k\Omega$
t_{PLH} $R_L = 1k\Omega$
$R_L = 350\Omega$

t_{PHL} $R_L = 350\Omega$
$1k\Omega$
$4k\Omega$

Forward current I_F (mA)
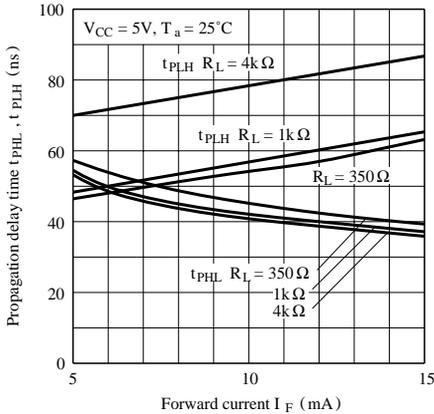
Fig. 9 Propagation Delay Time vs.
Ambient Temperature

Propagation delay time t_{PHL}, t_{PLH} (ns)

$I_F = 7.5mA$, $V_{CC} = 5V$

$R_L = 4k\Omega$
t_{PLH}
$1k\Omega$
350Ω
t_{PHL}
$R_L = 350\Omega$
$1k\Omega$
$4k\Omega$

Ambient temperature T_a (°C)
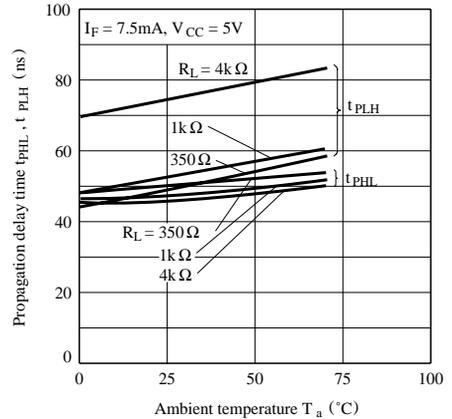
Fig. 10 Rise Time, Fall Time vs.
Ambient Temperature

Rise time, fall time t_r, t_f (ns)

t_r
$R_L = 4k\Omega$
$I_F = 7.5mA$
$V_{CC} = 5V$

t_r $R_L = 1k\Omega$
$R_L = 350\Omega$ $R_L = 350\Omega$
t_r
t_f $1k\Omega$
$4k\Omega$

Ambient temperature T_a (°C)
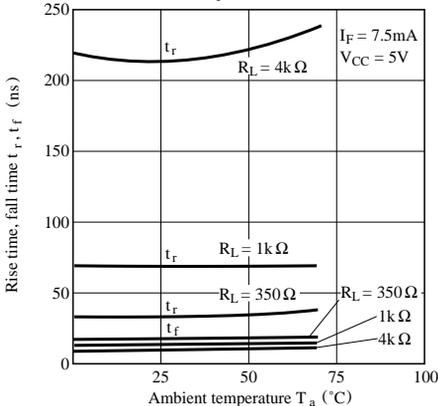
■ Precautions for Use

（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"

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