

# PC923

## High Speed Photocoupler for MOS-FET / IGBT Drive

\* Lead forming type ( I type ) and taping reel type ( P type ) are also available. ( PC923I/PC923P )

\* \* TÜV ( VDE 0884 ) approved type is also available as an option.

### ■ Features

1. Built-in direct drive circuit for MOS-FET/  
IGBT drive

(  $I_{O1P}$ ,  $I_{O2P}$  : 0.4A )

2. High speed response

(  $t_{PLH}$ ,  $t_{PHL}$  : MAX. 0.5  $\mu$ s )

3. Wide operating supply voltage range

(  $V_{CC}$  : 15 to 30V,  $T_a$  = -10 to 60°C )

4. High noise reduction type

(  $CM_{H=}$  = MIN. -1 500V/ $\mu$ s )

(  $CM_{L=}$  = MIN. 1 500V/ $\mu$ s )

5. Recognized by UL, file No. E64380

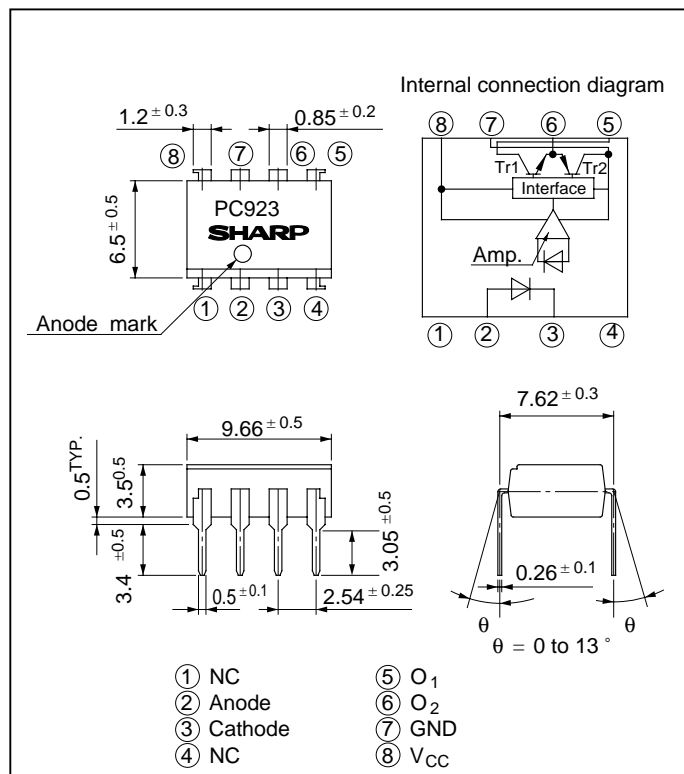
6. High isolation voltage between input  
and output (  $V_{ISO}$  = 5 000 V<sub>rms</sub> )

### ■ Applications

1. Inverter controlled air conditioners

### ■ 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

(  $T_a = T_{opr}$  unless otherwise specified )

Parameter	Symbol	Rating	Unit
Input	Forward current	$I_F$	20 mA
	*1 Reverse voltage	$V_R$	6 V
Output	Supply voltage	$V_{CC}$	35 V
	$O_1$ output current	$I_{O1}$	0.1 A
	*2 $O_1$ peak output current	$I_{O1P}$	0.4 A
	$O_2$ output current	$I_{O2}$	0.1 A
	*2 $O_2$ peak output current	$I_{O2P}$	0.4 A
	$O_1$ output voltage	$V_{O1}$	35 V
	Power dissipation	$P_O$	500 mW
	Total power dissipation	$P_{tot}$	550 mW
*3 Isolation voltage	$V_{iso}$	5 000	V <sub>rms</sub>
Operating temperature	$T_{opr}$	- 25 to + 80	°C
Storage temperature	$T_{stg}$	- 55 to + 125	°C
*4 Soldering temperature	$T_{sol}$	260	°C

\*1  $T_a = 25^\circ\text{C}$

\*2 Pulse width  $\leq 0.15\mu\text{s}$ ,  
Duty ratio: 0.01

\*3 40 to 60% RH, AC for 1 minute,  
 $T_a = 25^\circ\text{C}$

\*4 For 10 seconds

## ■ Electro-optical Characteristics

( $T_a = T_{opr}$  unless otherwise specified)

Parameter		Symbol	*5 Conditions	MIN.	TYP.	MAX.	Unit	Fig.	
Input	Forward voltage	$V_{F1}$	$T_a = 25^\circ\text{C}, I_F = 10\text{mA}$	-	1.6	1.75	V	-	
		$V_{F2}$	$T_a = 25^\circ\text{C}, I_F = 0.2\text{mA}$	1.2	1.5	-	V	-	
	Reverse current	$I_R$	$T_a = 25^\circ\text{C}, V_R = 5\text{V}$	-	-	10	$\mu\text{A}$	-	
	Terminal capacitance	$C_t$	$T_a = 25^\circ\text{C}, V = 0, f = 1\text{MHz}$	-	30	250	pF	-	
Output	Operating supply voltage	$V_{CC}$	$T_a = -10 \text{ to } 60^\circ\text{C}$	15	-	30	V	-	
				15	-	24	V		
	O <sub>1</sub> low level output voltage	$V_{O1L}$	$V_{CC1} = 12\text{V}, V_{CC2} = -12\text{V}$ $I_{O1} = 0.1\text{A}, I_F = 5\text{mA}$	-	0.2	0.4	V	1	
	O <sub>2</sub> high level output voltage	$V_{O2H}$	$V_{CC} = V_{O1} = 24\text{V}, I_{O2} = -0.1\text{A}, I_F = 5\text{mA}$	18	21	-	V	2	
	O <sub>2</sub> low level output voltage	$V_{O2L}$	$V_{CC} = 24\text{V}, I_{O2} = 0.1\text{A}, I_F = 0$	-	1.2	2.0	V	3	
	O <sub>1</sub> leak current	$I_{O1L}$	$T_a = 25^\circ\text{C}, V_{CC} = V_{O1} = 35\text{V}, I_F = 0$	-	-	500	$\mu\text{A}$	4	
	O <sub>2</sub> leak current	$I_{O2L}$	$T_a = 25^\circ\text{C}, V_{CC} = V_{O2} = 35\text{V}, I_F = 5\text{mA}$	-	-	500	$\mu\text{A}$	5	
	High level supply current	$I_{CCH}$	$T_a = 25^\circ\text{C}, V_{CC} = 24\text{V}, I_F = 5\text{mA}$	-	6	10	mA	6	
			$V_{CC} = 24\text{V}, I_F = 5\text{mA}$	-	-	14	mA		
Low level supply current	$I_{CCL}$	$T_a = 25^\circ\text{C}, V_{CC} = 24\text{V}, I_F = 0$	-	8	13	mA	6		
		$V_{CC} = 24\text{V}, I_F = 0$	-	-	17	mA			
Transfer characteristics	*6 “Low→High” threshold input current	$I_{FLH}$	$T_a = 25^\circ\text{C}, V_{CC} = 24\text{V}$	0.3	1.5	3.0	mA	7	
			$V_{CC} = 24\text{V}$	0.2	-	5.0	mA		
	Isolation resistance	$R_{ISO}$	$T_a = 25^\circ\text{C}, \text{DC} = 500\text{V}, 40 \text{ to } 60\% \text{RH}$	$5 \times 10^{10}$	$10^{11}$	-	$\Omega$	-	
	Response time		“Low→High” propagation delay time	$T_a = 25^\circ\text{C}, V_{CC} = 24\text{V},$ $I_F = 5\text{mA}$ $R_C = 47\Omega, C_G = 3000\text{pF}$	-	0.3	0.5	$\mu\text{s}$	8
			“High→Low” propagation delay time		-	0.3	0.5	$\mu\text{s}$	
			Rise time		-	0.2	0.5	$\mu\text{s}$	
			Fall time		-	0.2	0.5	$\mu\text{s}$	
Instantaneous common mode rejection voltage “Output : High level”	$CH_M$	$T_a = 25^\circ\text{C}, V_{CM} = 600\text{V}(\text{peak})$ $I_F = 5\text{mA}, V_{CC} = 24\text{V}, \Delta V_{O2H} = 2.0\text{V}$	-	-30	-	kV/ $\mu\text{s}$	9		
Instantaneous common mode rejection voltage “Output : Low level”	$CM_L$	$T_a = 25^\circ\text{C}, V_{CM} = 600\text{V}(\text{peak})$ $I_F = 0, V_{CC} = 24\text{V}, \Delta V_{O2L} = 2.0\text{V}$	-	30	-	kV/ $\mu\text{s}$			

\*5 When measuring output and transfer characteristics, connect a by-pass capacitor (0.01  $\mu\text{F}$  or more) between  $V_{CC}$  and GND near the **PC923**.

\*6  $I_{FLH}$  represents forward current when O<sub>2</sub>output goes from low to high.

## ■ Truth Table

Input	O <sub>2</sub> Output	Tr. 1	Tr. 2
ON	High level	ON	OFF
OFF	Low level	OFF	ON

■ Test Circuit

Fig. 1

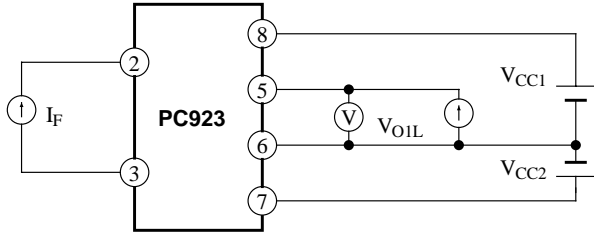


Fig. 2

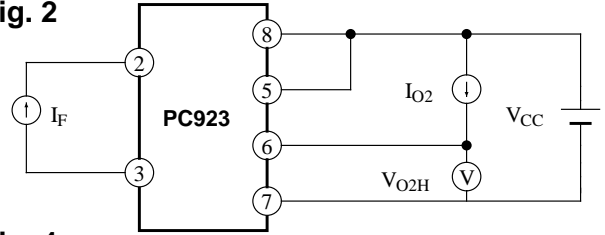


Fig. 3

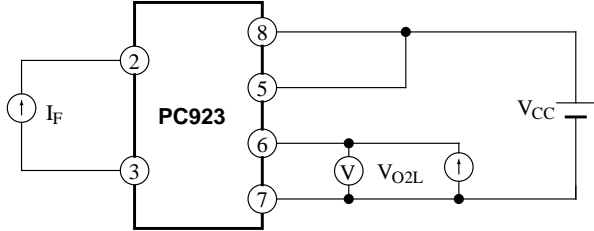


Fig. 4

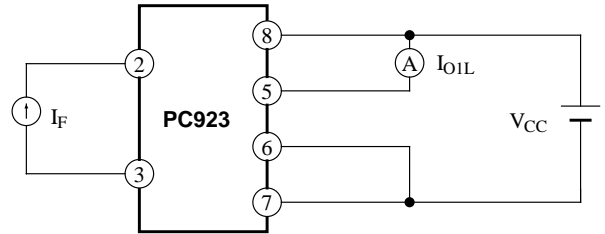


Fig. 5

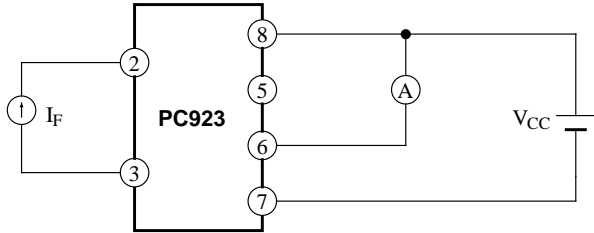


Fig. 6

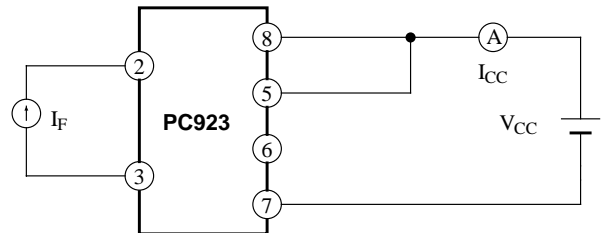


Fig. 7

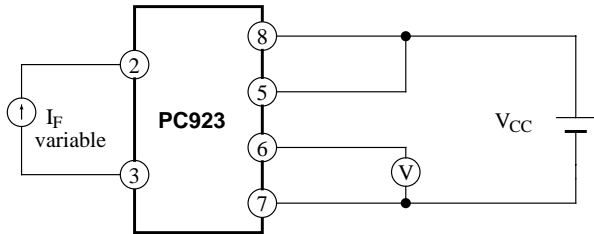


Fig. 8

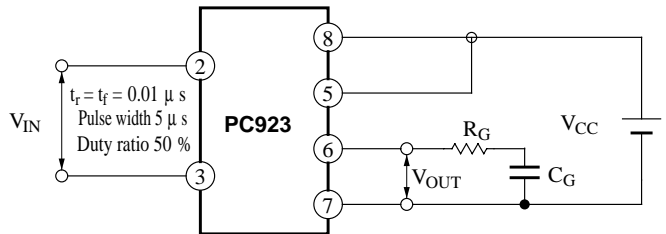
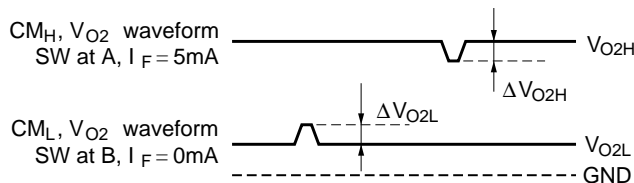
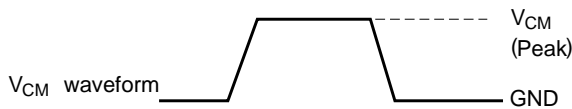
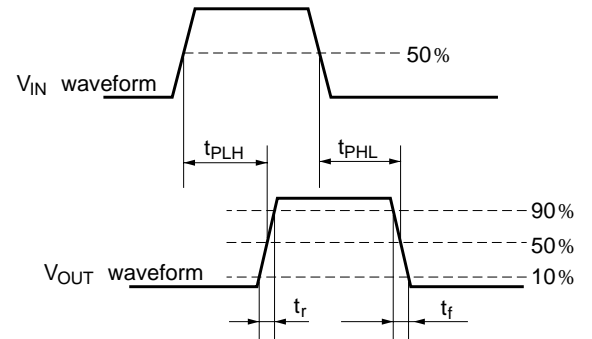
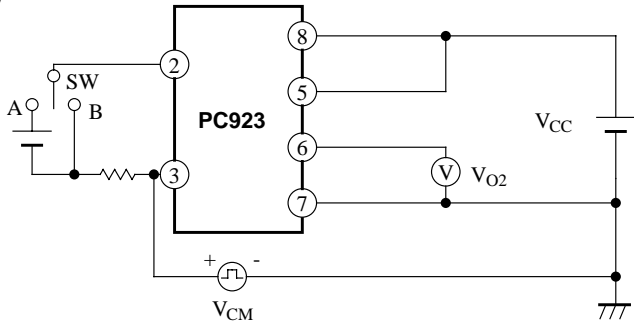
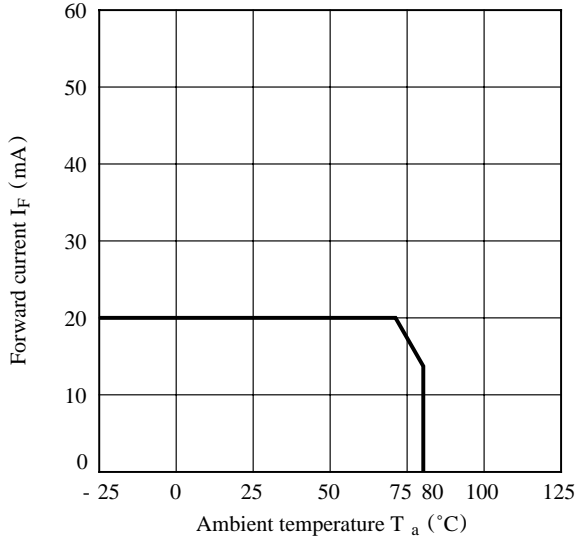


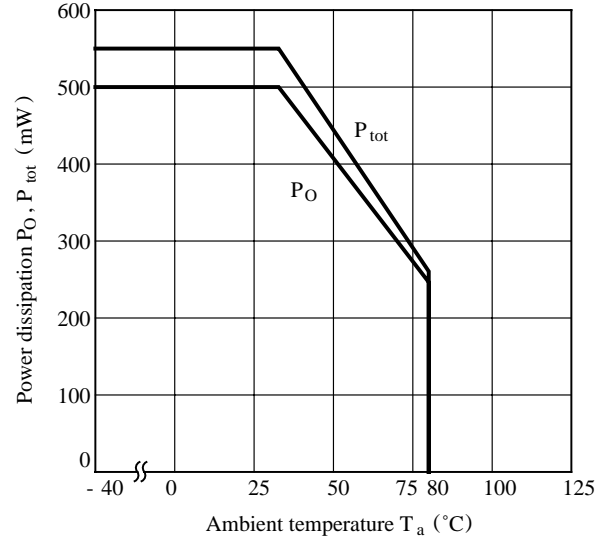
Fig. 9



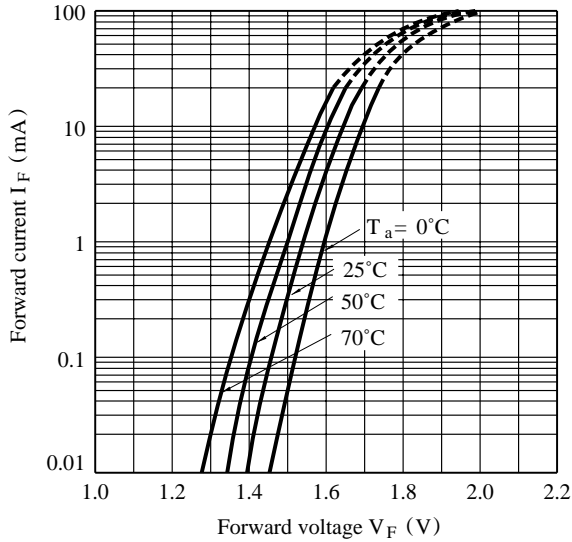
**Fig.10 Forward Current vs. Ambient Temperature**



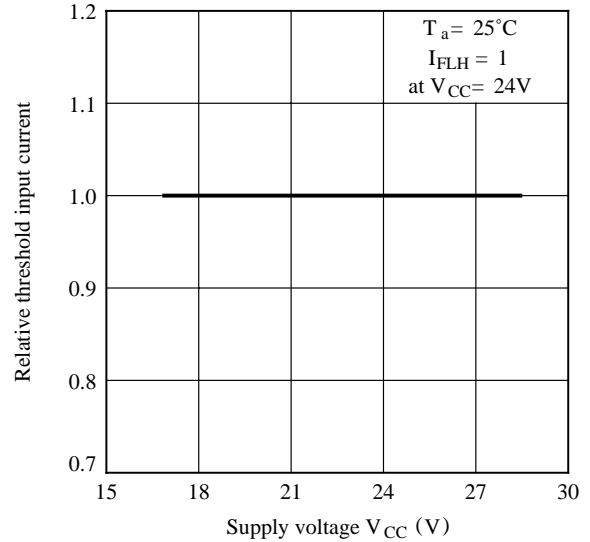
**Fig.11 Power Dissipation vs. Ambient Temperature**



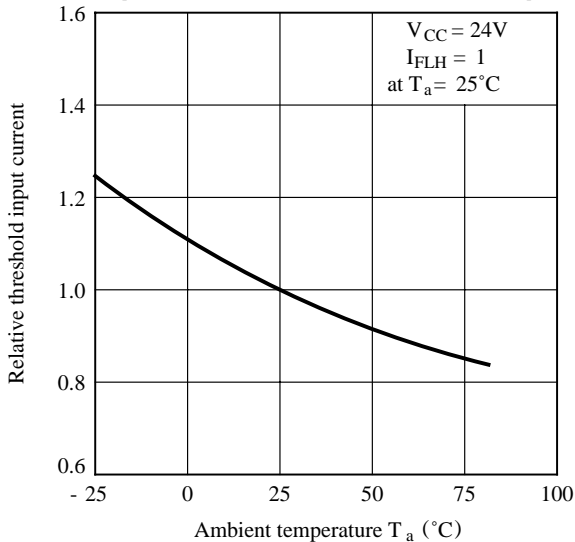
**Fig.12 Forward Current vs. Forward Voltage**



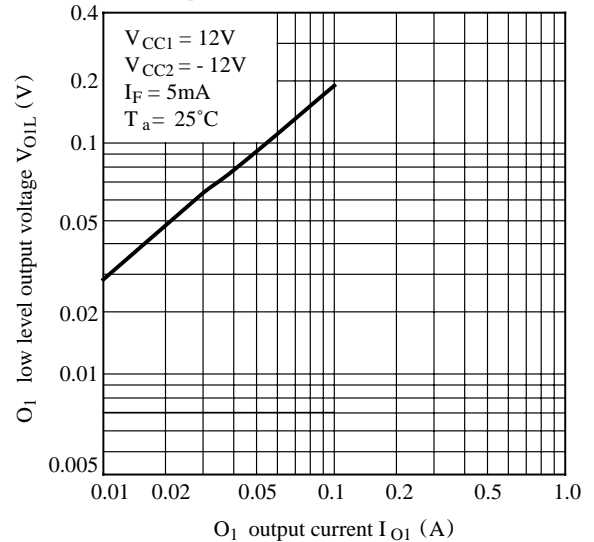
**Fig.13 “ Low → High ” Relative Threshold Input Current vs. Supply Voltage**



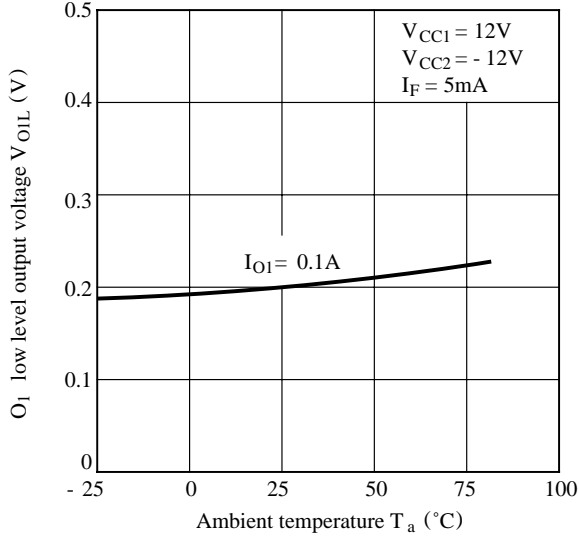
**Fig.14 “ Low → High ” Relative Threshold Input Current vs. Ambient Temperature**



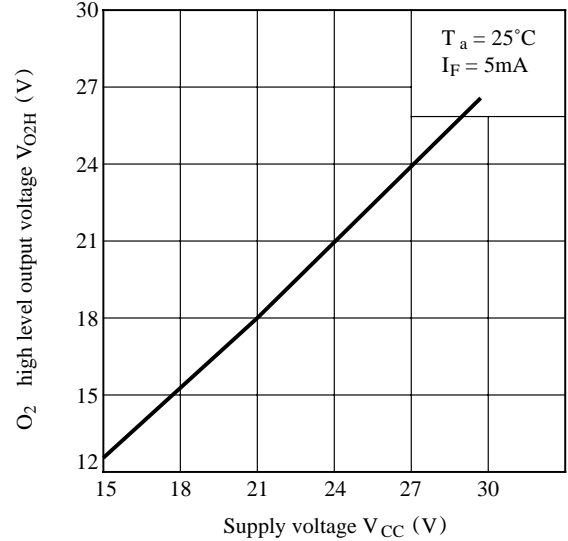
**Fig.15 O<sub>1</sub> Low Level Output Voltage vs. O<sub>1</sub> Output Current**



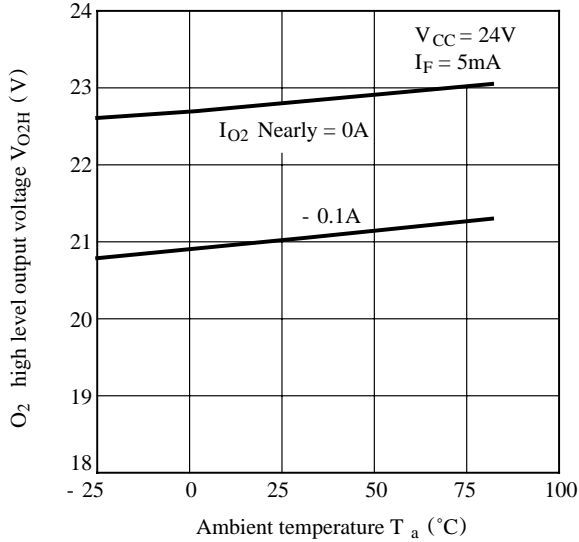
**Fig.16 O<sub>1</sub> Low Level Output Voltage vs. Ambient Temperature**



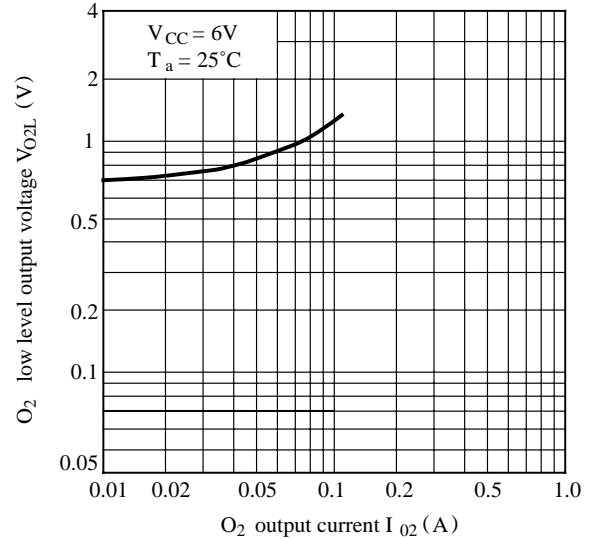
**Fig.17 O<sub>2</sub> High Level Output Voltage vs. Supply Voltage**



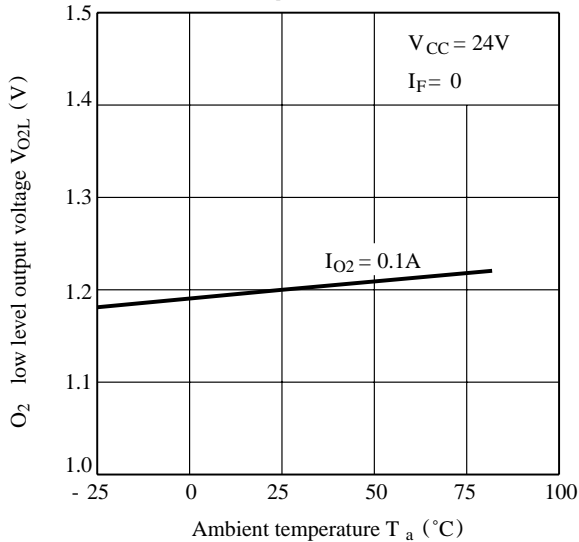
**Fig.18 O<sub>2</sub> High Level Output Voltage vs. Ambient Temperature**



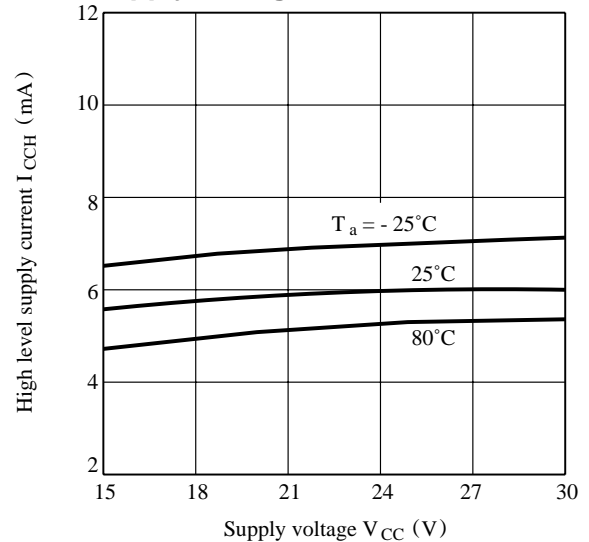
**Fig.19 O<sub>2</sub> Low Level Output Voltage vs. O<sub>2</sub> Output Current**



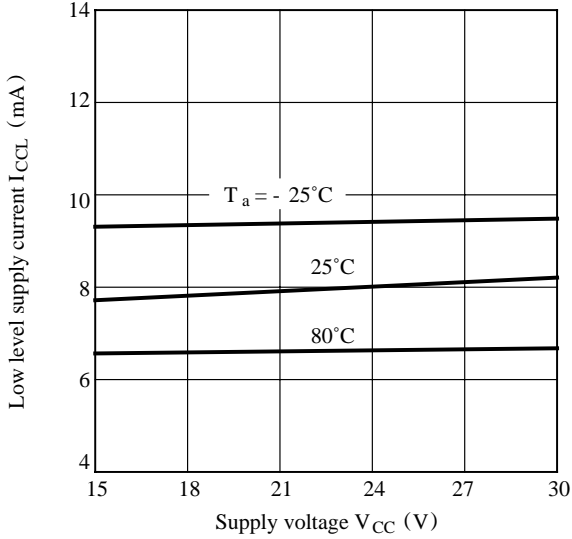
**Fig.20 O<sub>2</sub> Low Level Output Voltage vs. Ambient Temperature**



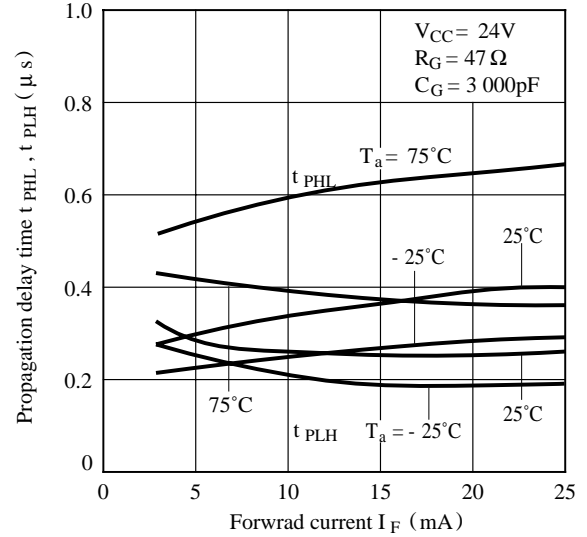
**Fig.21 High Level Supply Current vs. Supply Voltage**



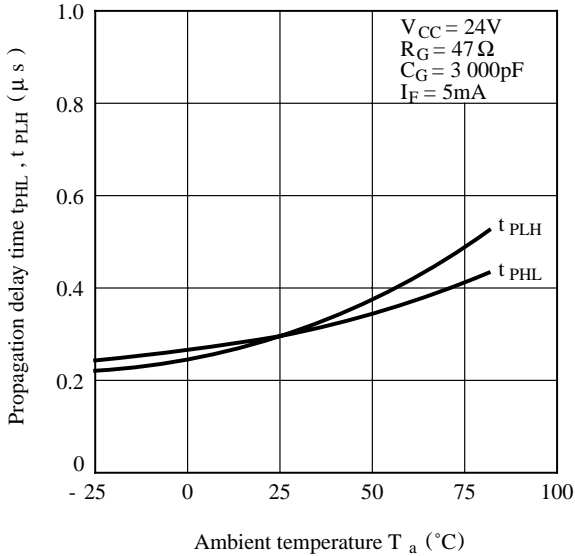
**Fig.22 Low Level Supply Current vs. Supply Voltage**



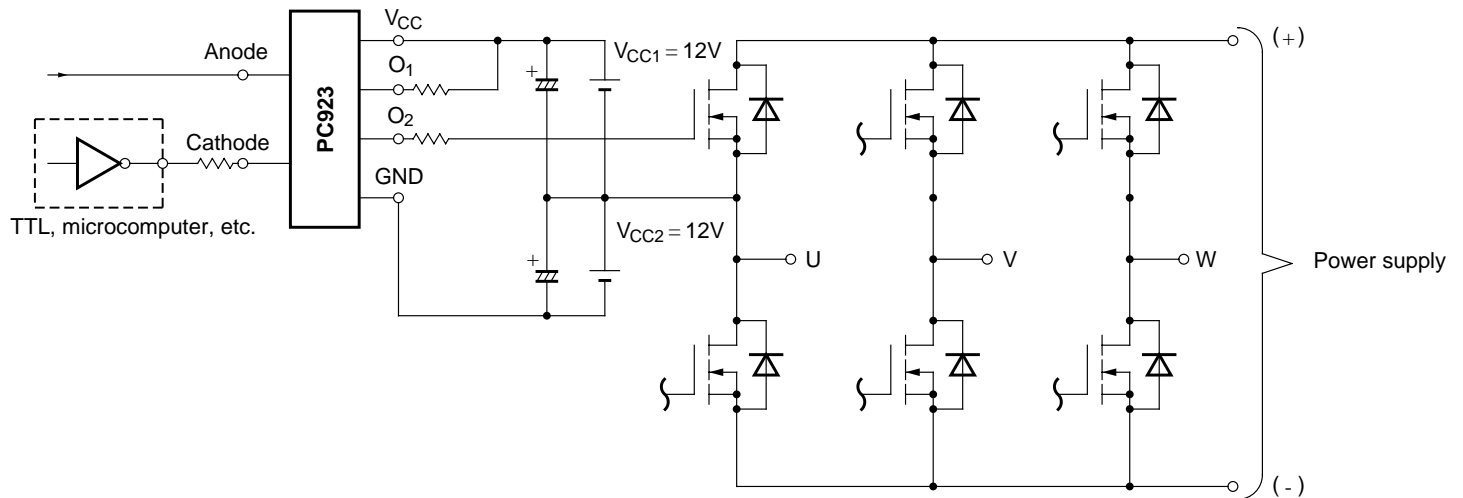
**Fig.23 Propagation Delay Time vs. Forward current**



**Fig.24 Propagation Delay Time vs. Ambient Temperature**



**Application Circuit (For Power MOS-FET Driving Inverter )**



● Please refer to the chapter “Precautions for Use.”