

# 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

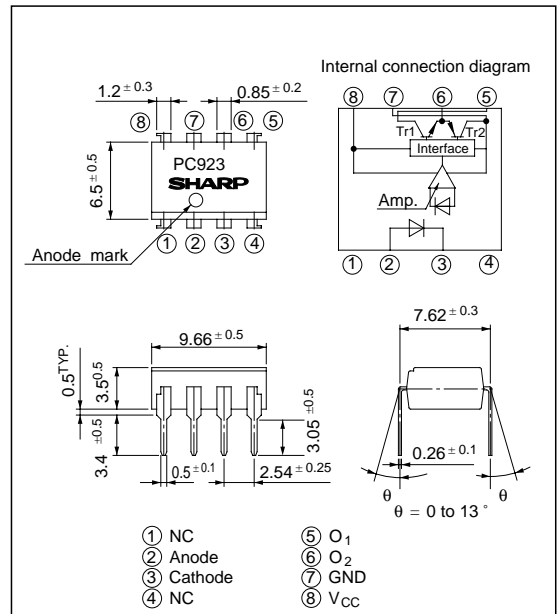
6. High isolation voltage between input and output (  $V_{ISO}$  = 5 000 V<sub>rms</sub> )

### ■ 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
Supply voltage		$V_{CC}$	35	V
Output	$O_1$ 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

(Ta = T<sub>opr</sub> unless otherwise specified)

Parameter		Symbol	*5 Conditions	MIN.	TYP.	MAX.	Unit	Fig.			
Input	Forward voltage	V <sub>F1</sub>	Ta = 25°C, I <sub>F</sub> = 10mA	-	1.6	1.75	V	-			
		V <sub>F2</sub>	Ta = 25°C, I <sub>F</sub> = 0.2mA	1.2	1.5	-	V	-			
	Reverse current	I <sub>R</sub>	Ta = 25°C, V <sub>R</sub> = 5V	-	-	10	μA	-			
	Terminal capacitance	C <sub>t</sub>	Ta = 25°C, V = 0, f = 1MHz	-	30	250	pF	-			
Output	Operating supply voltage	V <sub>CC</sub>	Ta = -10 to 60°C	15	-	30	V	-			
				15	-	24	V				
	O <sub>1</sub> low level output voltage	V <sub>O1L</sub>	V <sub>CC1</sub> = 12V, V <sub>CC2</sub> = -12V I <sub>O1</sub> = 0.1A, I <sub>F</sub> = 5mA	-	0.2	0.4	V	1			
	O <sub>2</sub> high level output voltage	V <sub>O2H</sub>	V <sub>CC</sub> = V <sub>O1</sub> = 24V, I <sub>O2</sub> = -0.1A, I <sub>F</sub> = 5mA	18	21	-	V	2			
	O <sub>2</sub> low level output voltage	V <sub>O2L</sub>	V <sub>CC</sub> = 24V, I <sub>O2</sub> = 0.1A, I <sub>F</sub> = 0	-	1.2	2.0	V	3			
	O <sub>1</sub> leak current	I <sub>O1L</sub>	Ta = 25°C, V <sub>CC</sub> = V <sub>O1</sub> = 35V, I <sub>F</sub> = 0	-	-	500	μA	4			
	O <sub>2</sub> leak current	I <sub>O2L</sub>	Ta = 25°C, V <sub>CC</sub> = V <sub>O2</sub> = 35V, I <sub>F</sub> = 5mA	-	-	500	μA	5			
	High level supply current	I <sub>CCH</sub>	Ta = 25°C, V <sub>CC</sub> = 24V, I <sub>F</sub> = 5mA	-	6	10	mA	6			
V <sub>CC</sub> = 24V, I <sub>F</sub> = 5mA			-	-	14	mA					
Low level supply current			I <sub>CCL</sub>	Ta = 25°C, V <sub>CC</sub> = 24V, I <sub>F</sub> = 0	-	8	13		mA		
Transfer characteristics	*6 "Low→High" threshold input current	I <sub>FLH</sub>	Ta = 25°C, V <sub>CC</sub> = 24V	0.3	1.5	3.0	mA	7			
			V <sub>CC</sub> = 24V	0.2	-	5.0	mA				
	Response time	Isolation resistance	R <sub>ISO</sub>	Ta = 25°C, DC = 500V, 40 to 60% RH	5 x 10 <sup>10</sup>	10 <sup>11</sup>	-	Ω	-		
				"Low→High" propagation delay time	t <sub>PLH</sub>	Ta = 25°C, V <sub>CC</sub> = 24V, I <sub>F</sub> = 5mA R <sub>C</sub> = 47Ω, C <sub>G</sub> = 3 000pF	-	0.3	0.5	μs	8
				"High→Low" propagation delay time	t <sub>PHL</sub>		-	0.3	0.5	μs	
				Rise time	t <sub>r</sub>		-	0.2	0.5	μs	
	Fall time	t <sub>f</sub>	-	0.2	0.5		μs				
	Instantaneous common mode rejection voltage "Output: High level"	CH <sub>M</sub>	Ta = 25°C, V <sub>CM</sub> = 600V(peak) I <sub>F</sub> = 5mA, V <sub>CC</sub> = 24V, ΔV <sub>O2H</sub> = 2.0V	-	-30	-	kV/μs	9			
Instantaneous common mode rejection voltage "Output: Low level"			CM <sub>L</sub>	Ta = 25°C, V <sub>CM</sub> = 600V(peak) I <sub>F</sub> = 0, V <sub>CC</sub> = 24V, ΔV <sub>O2L</sub> = 2.0V	-	30	-		kV/μs		

\*5 When measuring output and transfer characteristics, connect a by-pass capacitor (0.01 μF or more) between V<sub>CC</sub> and GND near the **PC923**.

\*6 I<sub>FLH</sub> 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

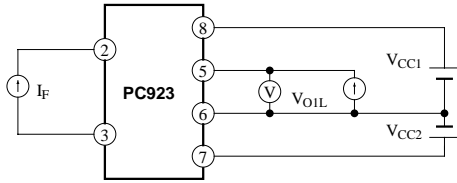


Fig. 3

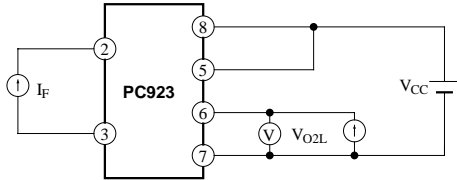


Fig. 5

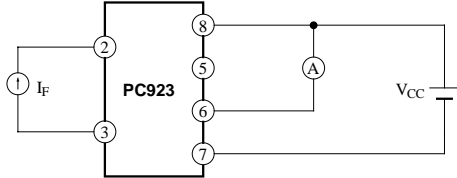


Fig. 7

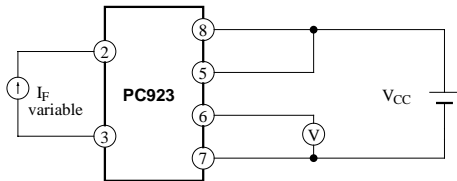


Fig. 9

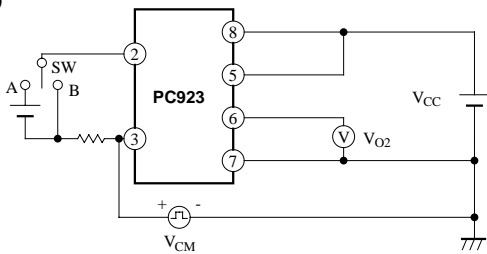


Fig. 2

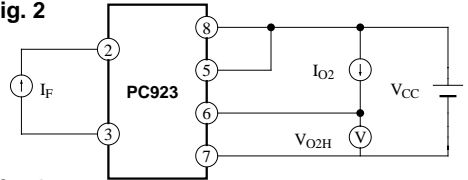


Fig. 4

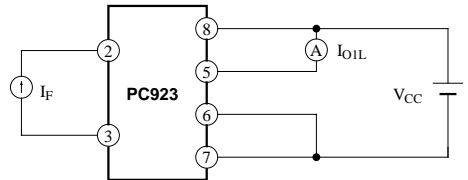


Fig. 6

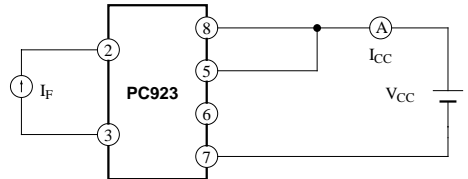
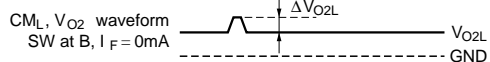
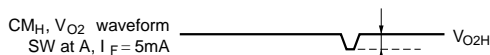
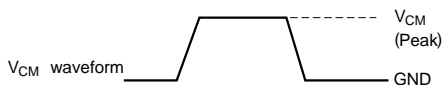
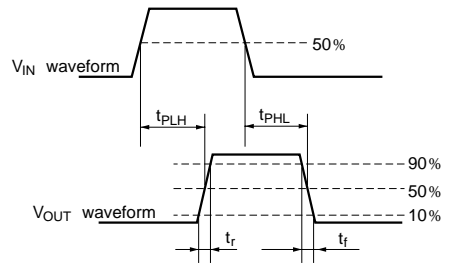
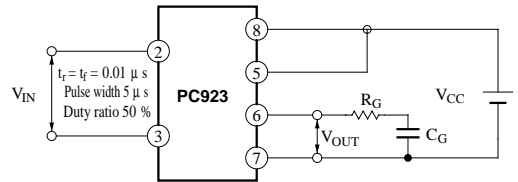
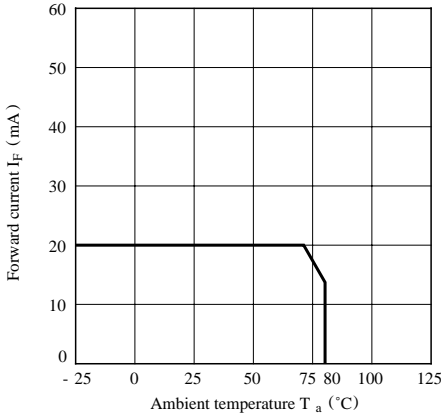


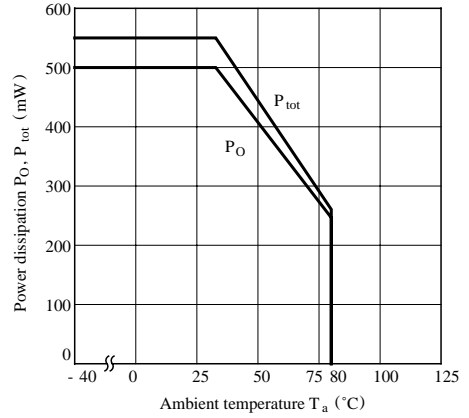
Fig. 8



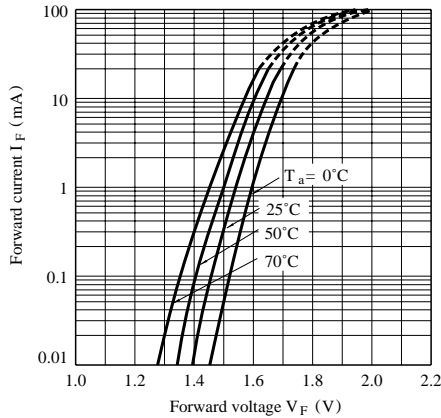
**Fig.10 Forward Current vs. Ambient Temperature**



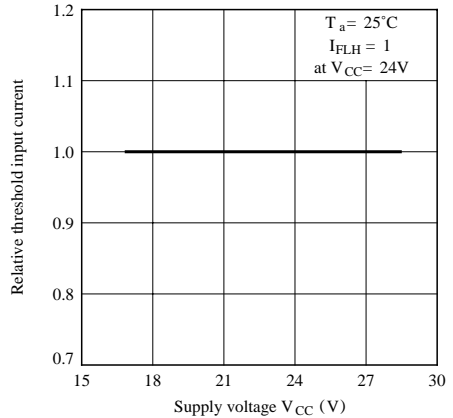
**Fig.11 Power Dissipation vs. Ambient Temperature**



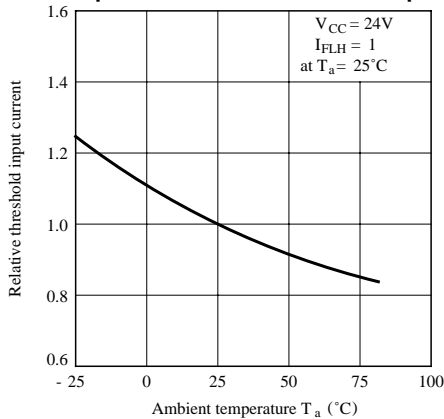
**Fig.12 Forward Current vs. Forward Voltage**



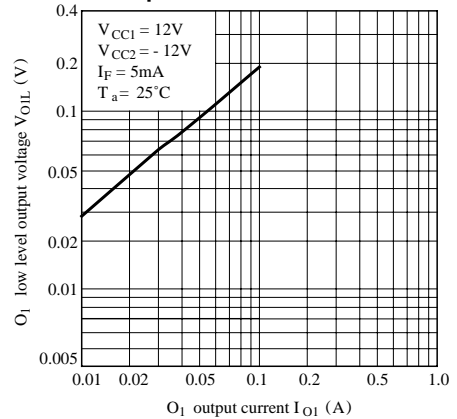
**Fig.13 “Low → High” Relative Threshold Input Current vs. Supply Voltage**



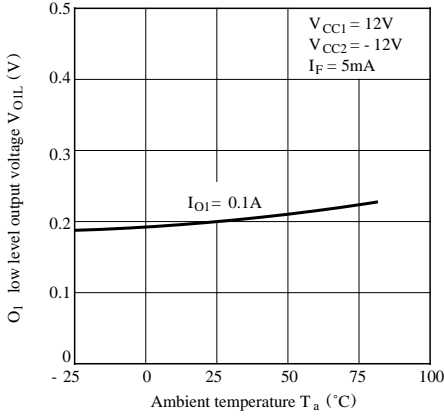
**Fig.14 “Low → High” Relative Threshold Input Current vs. Ambient Temperature**



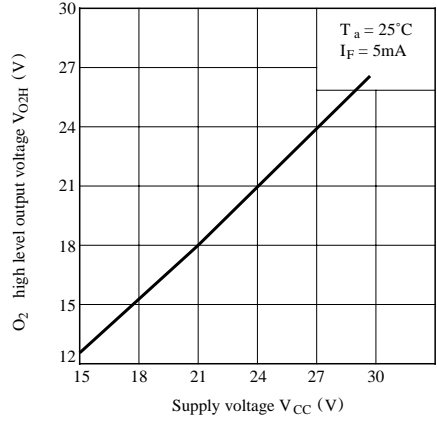
**Fig.15 O<sub>1</sub> Low Level Output Voltage vs. O<sub>1</sub> Output Current**



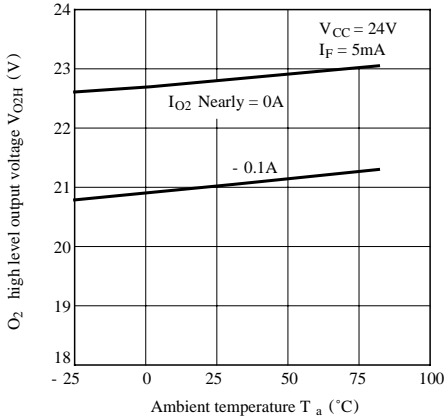
**Fig.16 O<sub>1</sub> Low Level Output Voltage vs. Ambient Temperature**



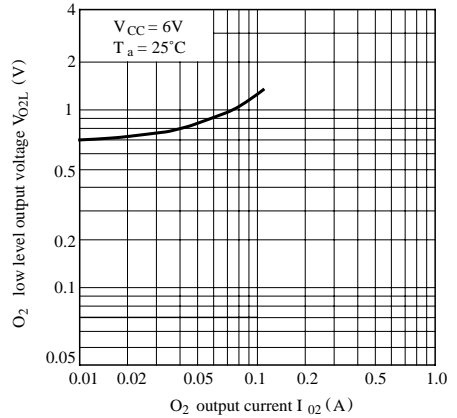
**Fig.17 O<sub>2</sub> High Level Output Voltage vs. Supply Voltage**



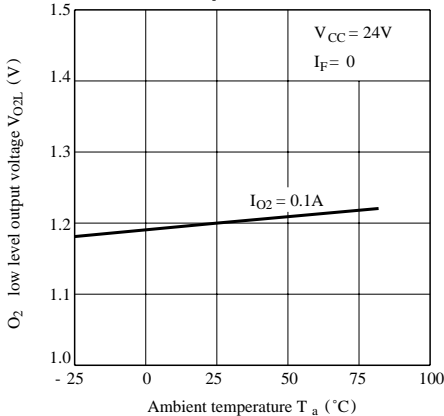
**Fig.18 O<sub>2</sub> High Level Output Voltage vs. Ambient Temperature**



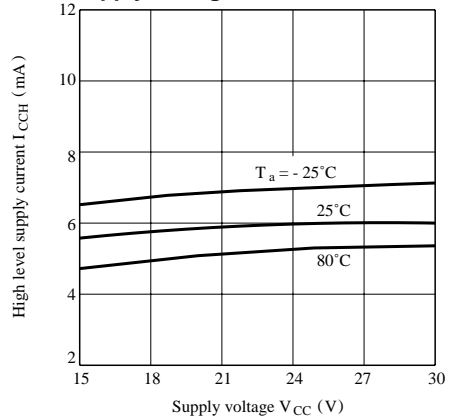
**Fig.19 O<sub>2</sub> Low Level Output Voltage vs. O<sub>2</sub> Output Current**



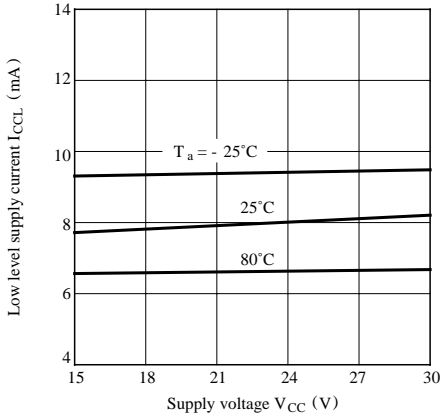
**Fig.20 O<sub>2</sub> Low Level Output Voltage vs. Ambient Temperature**



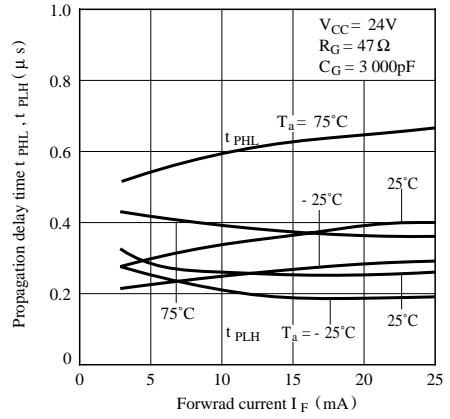
**Fig.21 High Level Supply Current vs. Supply Voltage**



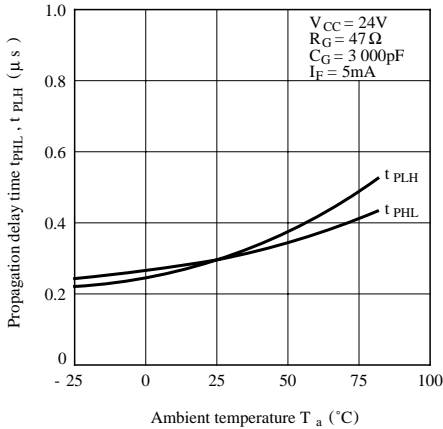
**Fig.22 Low Level Supply Current vs. Supply Voltage**



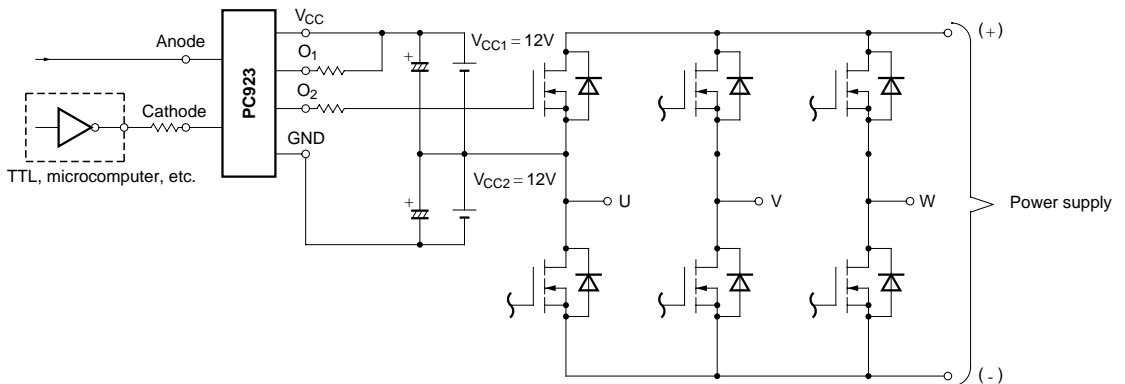
**Fig.23 Propagation Delay Time vs. Forward current**



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



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



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