

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) (Page 656)

■ Features

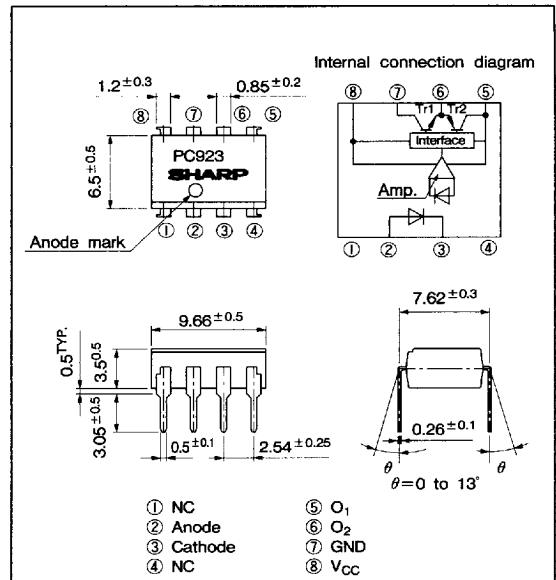
1. Built-in direct drive circuit for MOS-FET/IGBT drive
(I_{O1P} , I_{O2P} : 0.4A)
2. High speed response
(t_{FLH} , t_{PHL} : MAX. $0.5 \mu s$)
3. Wide operating supply voltage range
(V_{CC} : 15 to 30V, $T_a = -10$ to $60^\circ C$)
4. High noise reduction type
(CM_H = MIN. $-1\ 500V/\mu s$)
(CM_L = MIN. $1\ 500V/\mu s$)
5. Recognized by UL, file No. E64380
6. High isolation voltage between input and output ($V_{ISO} = 5\ 000\ V_{rms}$)

■ 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_I	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_{rms}
	Operating temperature	T_{opr}	-25 to $+80$	$^\circ C$
	Storage temperature	T_{stg}	-55 to $+125$	$^\circ C$
	*4 Soldering temperature	T_{sol}	260	$^\circ C$

*1 $T_a = 25^\circ C$

*2 Pulse width $\leq 0.15 \mu s$,
Duty ratio = 0.01

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

*4 For 10 seconds

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■ Electro-optical Characteristics

(Ta = T_{opr} unless otherwise specified)

Parameter		Symbol	*5 Conditions	MIN.	TYP.	MAX.	Unit	Fig.
Input	Forward voltage	V _{F1}	Ta = 25°C, I _F = 10mA	—	1.6	1.75	V	—
		V _{F2}	Ta = 25°C, I _F = 0.2mA	1.2	1.5	—	V	—
	Reverse current	I _R	Ta = 25°C, V _R = 5V	—	—	10	μA	—
	Terminal capacitance	C _t	Ta = 25°C, V = 0, f = 1MHz	—	30	250	pF	—
Output	Operating supply voltage	V _{CC}	Ta = -10 to 60°C	15	—	30	V	—
				15	—	24	V	
	O ₁ low level output voltage	V _{O1L}	V _{CC1} = 12V, V _{CC2} = -12V I _{O1} = 0.1A, I _F = 5mA	—	0.2	0.4	V	1
	O ₂ high level output voltage	V _{O2H}	V _{CC} = V _{O1} = 24V, I _{O2} = -0.1A, I _F = 5mA	18	21	—	V	2
	O ₂ low level output voltage	V _{O2L}	V _{CC} = 24V, I _{O2} = 0.1A, I _F = 0	—	1.2	2.0	V	3
	O ₁ leak current	I _{O1L}	Ta = 25°C, V _{CC} = V _{O1} = 35V, I _F = 0	—	—	500	μA	4
	O ₂ leak current	I _{O2L}	Ta = 25°C, V _{CC} = V _{O2} = 35V, I _F = 5mA	—	—	500	μA	5
	High level supply current	I _{CCH}	Ta = 25°C, V _{CC} = 24V, I _F = 5mA	—	6	10	mA	6
			V _{CC} = 24V, I _F = 5mA	—	—	14	mA	
	Low level supply current	I _{CCL}	Ta = 25°C, V _{CC} = 24V, I _F = 0	—	8	13	mA	
			V _{CC} = 24V, I _F = 0	—	—	17	mA	
Transfer characteristics	*6 "Low→High" threshold input current	I _{FLH}	Ta = 25°C, V _{CC} = 24V	0.3	1.5	3.0	mA	7
			V _{CC} = 24V	0.2	—	5.0	mA	
	Isolation resistance	R _{ISO}	Ta = 25°C, DC = 500V, 40 to 60%RH	5 × 10 ¹⁰	10 ¹¹	—	Ω	—
	Response time	"Low→High" propagation delay time	Ta = 25°C, V _{CC} = 24V, I _F = 5mA R _C = 47Ω, C _G = 3 000pF	—	0.3	0.5	μs	8
		"High→Low" propagation delay time		—	0.3	0.5	μs	
		Rise time		—	0.2	0.5	μs	
		Fall time		—	0.2	0.5	μs	
	Instantaneous common mode rejection voltage "Output : High level"	CH _M	Ta = 25°C, V _{CM} = 600V(peak) I _F = 5mA, V _{CC} = 24V, ΔV _{O2H} = 2.0V	-1500	—	—	V/μs	9
	Instantaneous common mode rejection voltage "Output : Low level"	CM _L	Ta = 25°C, V _{CM} = 600V(peak) I _F = 0, V _{CC} = 24V, ΔV _{O2L} = 2.0V	1500	—	—	V/μs	

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

*6 I_{FLH} represents forward current when output goes from low to high.

■ Truth Table

Input	O ₂ Output	Tr. 1	Tr. 2
ON	High level	ON	OFF
OFF	Low level	OFF	ON

6

Photocouplers

Test Circuit

Fig. 1

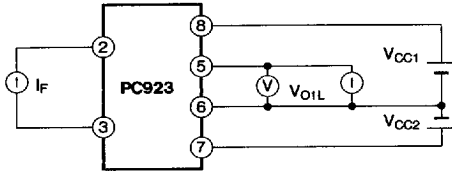


Fig. 3

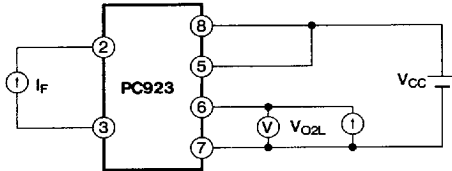


Fig. 5

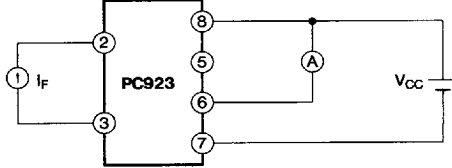


Fig. 7

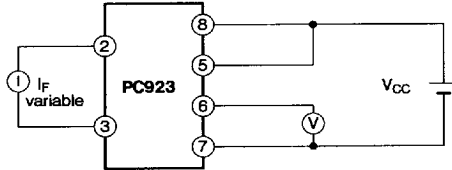


Fig. 9

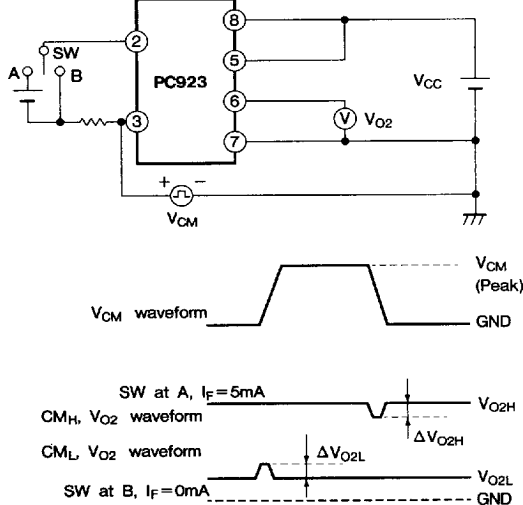


Fig. 2

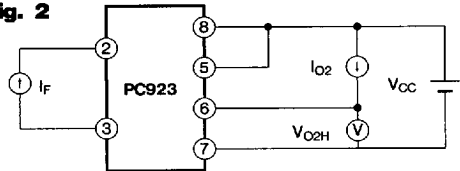


Fig. 4

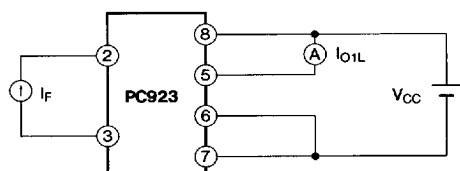


Fig. 6

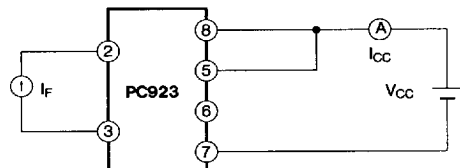


Fig. 8

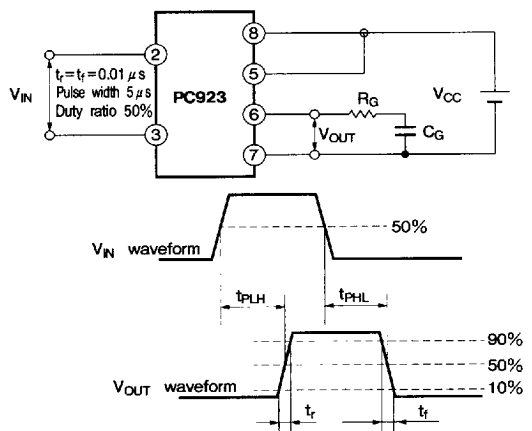


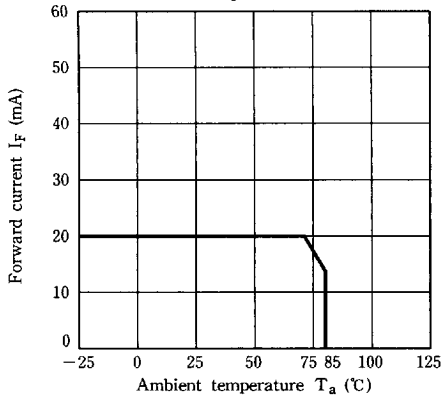
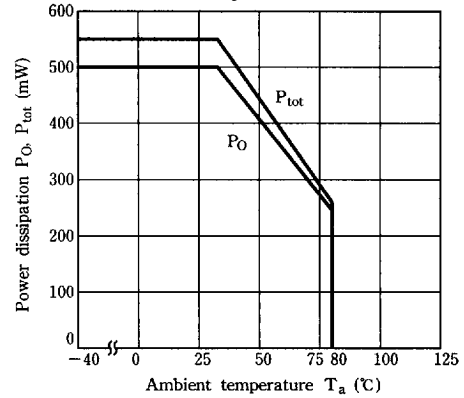
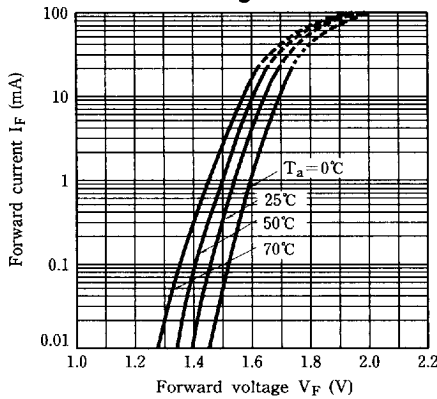
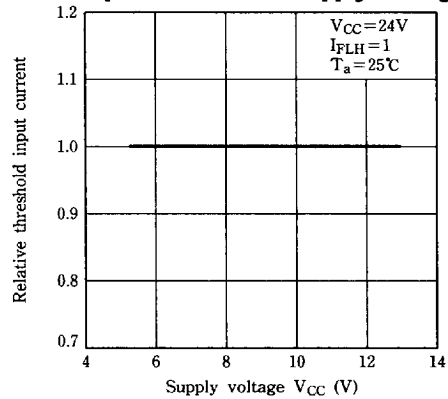
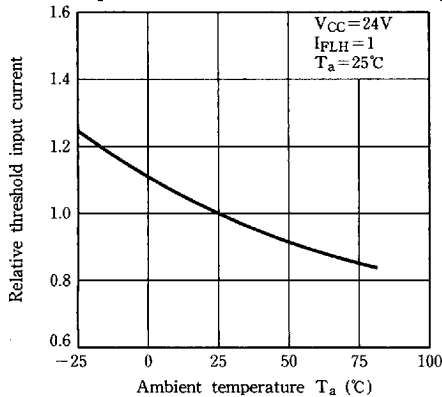
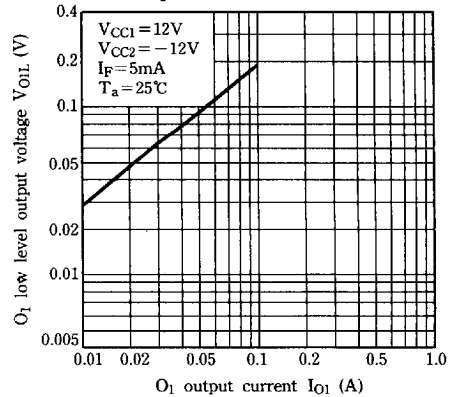
Fig.10 Forward Current vs. Ambient Temperature**Fig.11 Power Dissipation vs. Ambient Temperature****Fig.12 Forward Current vs. Forward Voltage****Fig.13 "Low→High" Relative Threshold Input Current vs. Supply Voltage****Fig.14 "Low→High" Relative Threshold Input Current vs. Ambient Temperature****Fig.15 O₁ Low Level Output Voltage vs. O₁ Output Current**

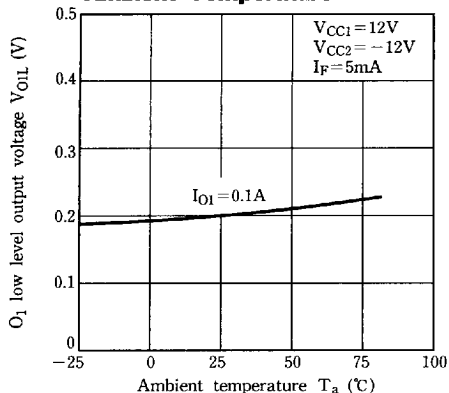
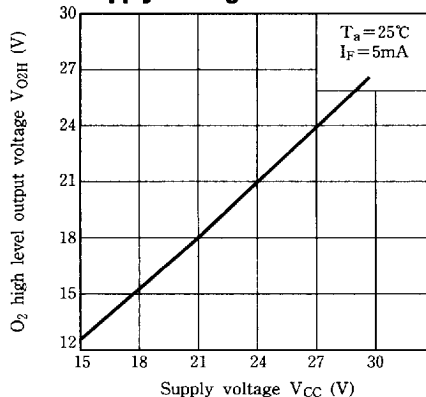
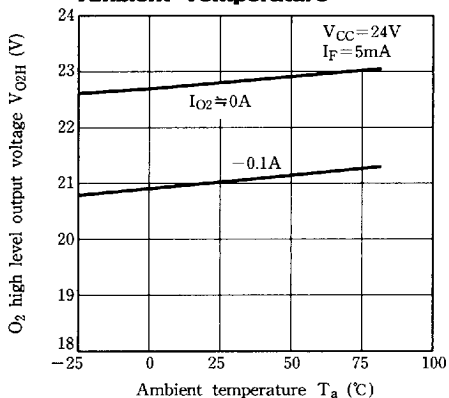
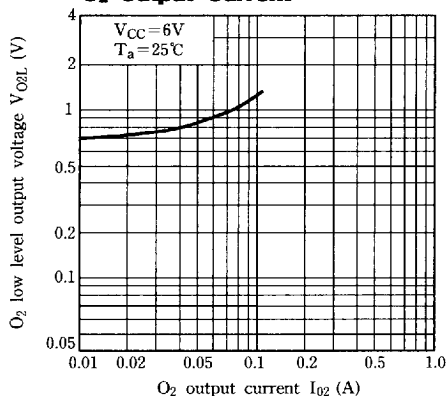
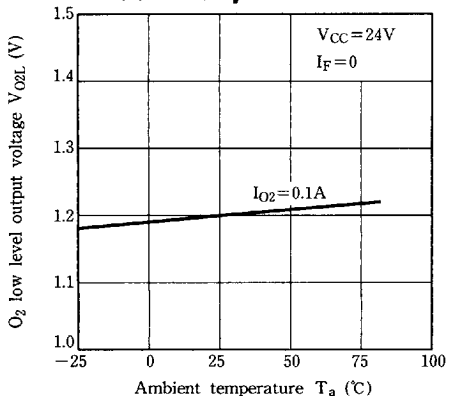
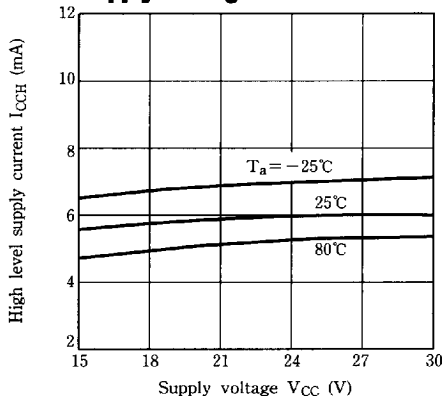
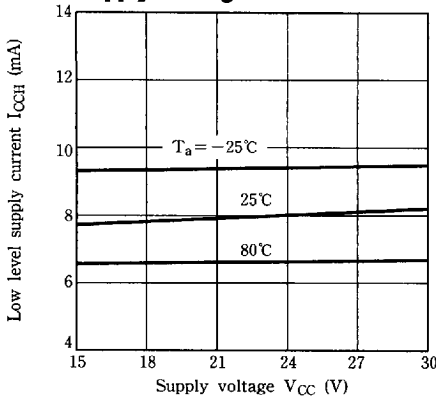
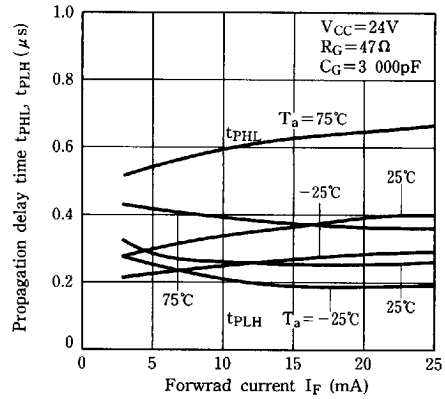
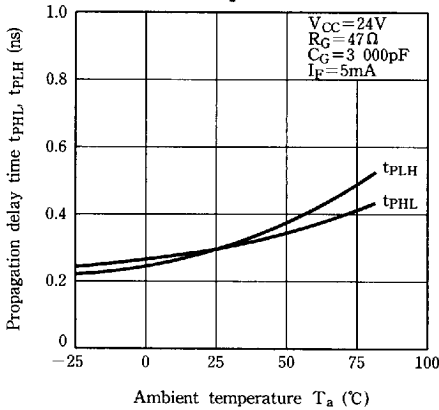
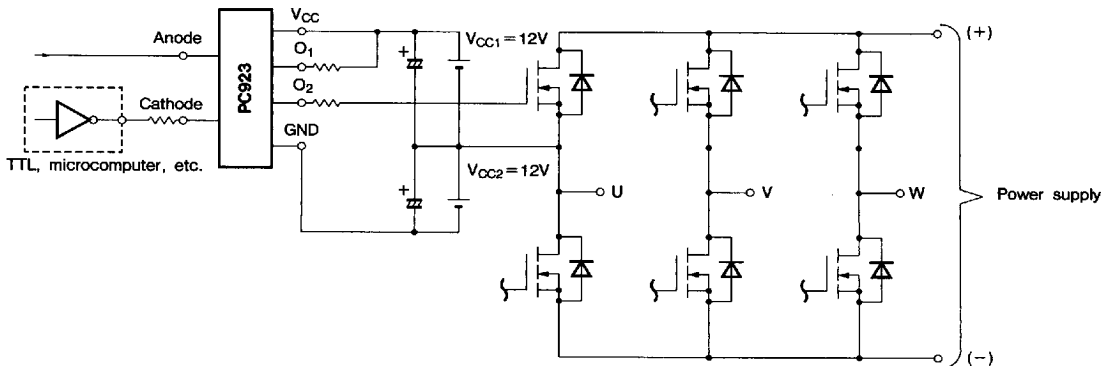
Fig.16 O₁ Low Level Output Voltage vs. Ambient Temperature**Fig.17 O₂ High Level Output Voltage vs. Supply Voltage****Fig.18 O₂ High Level Output Voltage vs. Ambient Temperature****Fig.19 O₂ Low Level Output Voltage vs. O₂ Output Current****Fig.20 O₂ Low Level Output Voltage vs. Ambient Temperature****Fig.21 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." (Page 78 to 93)