

# PC921 High Power OPIC Photocoupler

T-41-83

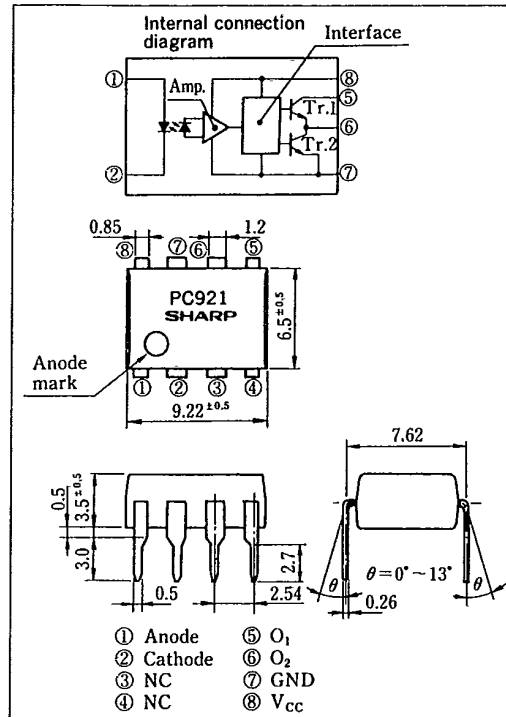
## Features

- Built-in base amplifier for power transistor drive
- High power ( $I_{O1}$  : MAX. 0.5A (DC)  
 $(I_{O2P}$  : MAX. 2.0A (pulse))
- High speed response  
 $(t_{PHL}, t_{PLH}$  : MAX. 5 $\mu$ s)
- High sensitivity ( $I_{FLH}$  : MAX. 5mA)
- UL recognized, file No. E64380

## Applications

- Inverter controlled air conditioners
- Low capacitance general purpose inverter

## Outline Dimensions (Unit : mm)



※ OPIC is a registered trademark of Sharp and stands for Optical IC. It has a light detecting element and signal processing circuitry integrated onto a single chip.

## Absolute Maximum Ratings (Unless otherwise specified, $T_a = T_{opr}$ )

	Parameter	Symbol	Rating	Unit
Input	Forward current	$I_F$	25	mA
	*1 Reverse voltage	$V_R$	6	V
Output	Supply voltage	$V_{CC}$	15	V
	$O_1$ output current	$I_{O1}$	0.5	A
	*2 $O_1$ peak output current	$I_{O1P}$	1.0	A
	$O_2$ output current	$I_{O2}$	0.6	A
	*2 $O_2$ peak output current	$I_{O2P}$	2.0	A
	$O_1$ Output voltage	$V_{O1}$	15	V
	Power dissipation	$P_O$	500	mW
	Total power dissipation	$P_{tot}$	550	mW
	*3 Isolation voltage	$V_{iso}$	2,000	Vrms
	Operating temperature	$T_{opr}$	-20 ~ +80	°C
	Storage temperature	$T_{stg}$	-55 ~ +125	°C
	*4 Soldering temperature	$T_{sol}$	260	°C

\*1  $T_a = 25^\circ\text{C}$   
 \*2 Pulse width  $\leq 5\mu\text{s}$ , Duty ratio = 0.01  
 \*3 RH = 40 ~ 60%, AC for 1 minute,  $T_a = 25^\circ\text{C}$   
 \*4 For 10 seconds

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■ Electro-optical Characteristics

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

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Fig.	
Input	Forward voltage	V <sub>F1</sub>	Ta=25°C, I <sub>F</sub> =5mA	—	1.1	1.4	V	—	
		V <sub>F2</sub>	Ta=25°C, I <sub>F</sub> =0.2mA	0.6	0.9	—	V	—	
	Reverse current	I <sub>R</sub>	Ta=25°C, V <sub>F</sub> =3V	—	—	10	μA	—	
	Terminal capacitance	C <sub>t</sub>	Ta=25°C, V=0, f=1kHz	—	30	250	pF	—	
Operating supply voltage		V <sub>CC</sub>	—	5.4	—	13	V	—	
Output	O <sub>1</sub> low level output voltage	V <sub>O1L</sub>	V <sub>CC</sub> =6V, I <sub>O1</sub> =0.4A, R <sub>L1</sub> =10Ω, 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> =6V, I <sub>O2</sub> =-0.4A, I <sub>F</sub> =5mA	4.5	5.0	—	V	2	
	O <sub>2</sub> low level output voltage	V <sub>O2L</sub>	V <sub>CC</sub> =6V, I <sub>O2</sub> =0.5A, I <sub>F</sub> =0	—	0.2	0.4	V	2	
	O <sub>1</sub> leak current	I <sub>O1L</sub>	V <sub>CC</sub> =13V, I <sub>F</sub> =0	—	—	200	μA	3	
	O <sub>2</sub> leak current	I <sub>O2L</sub>	V <sub>CC</sub> =13V, I <sub>F</sub> =5mA	—	—	200	μA	4	
	High level supply current	I <sub>CCH</sub>	Ta=25°C, V <sub>CC</sub> =6V, I <sub>F</sub> =5mA	—	9	13	mA	—	
			V <sub>CC</sub> =6V, I <sub>F</sub> =5mA	—	—	17	mA	—	
	Low level supply current	I <sub>CCL</sub>	Ta=25°C, V <sub>CC</sub> =6V, I <sub>F</sub> =0	—	11	15	mA	—	
			V <sub>CC</sub> =6V, I <sub>F</sub> =0	—	—	20	mA	—	
	*5 "Low→High" threshold input current		I <sub>FLH</sub>	Ta=25°C, V <sub>CC</sub> =6V, R <sub>L1</sub> =5Ω, R <sub>L2</sub> =10Ω	0.3	1.5	3.0	mA	5
			V <sub>CC</sub> =6V, R <sub>L1</sub> =5Ω, R <sub>L2</sub> =10Ω	0.2	—	5.0	mA	5	
Isolation resistance		R <sub>ISO</sub>	Ta=25°C, DC=500V, RH=40~60%	5×10 <sup>10</sup>	10 <sup>11</sup>	—	Ω	—	
Transfer characteristics	Response time	"Low→High" propagation time	t <sub>PLH</sub>	—	2	5	μs	6	
		"High→Low" propagation time	t <sub>PHL</sub>	Ta=25°C, V <sub>CC</sub> =6V, I <sub>F</sub> =5mA	—	2	5		μs
		Rise time	t <sub>r</sub>	R <sub>L1</sub> =5Ω, R <sub>L2</sub> =10Ω	—	0.2	1		μs
		Fall time	-t <sub>f</sub>		—	0.1	1		μs
	Instantaneous common mode rejection voltage "Output : high level"		CM <sub>H</sub>	Ta=25°C, V <sub>CM</sub> =600V <sub>(peak)</sub> , I <sub>F</sub> =5mA, R <sub>L1</sub> =470Ω, R <sub>L2</sub> =1kΩ, ΔV <sub>O2H</sub> =0.5V, V <sub>CC</sub> =6V	-1000	—	—	V/μs	7
Instantaneous common mode rejection voltage "Output : low level"		CM <sub>L</sub>	Ta=25°C, V <sub>CM</sub> =600V <sub>(peak)</sub> , I <sub>F</sub> =0, R <sub>L1</sub> =470Ω, R <sub>L2</sub> =1kΩ, ΔV <sub>O2L</sub> =0.5V, V <sub>CC</sub> =6V	1000	—	—	V/μs	7	

\*5 I<sub>FLH</sub> represents forward current when output goes from low to high.

■ Truth Table

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

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■ Test Circuit

Fig. 1

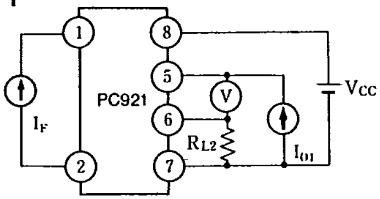


Fig. 2

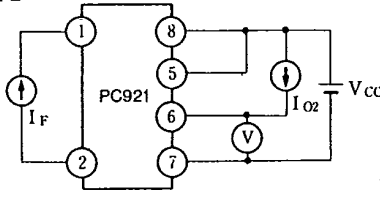


Fig. 3

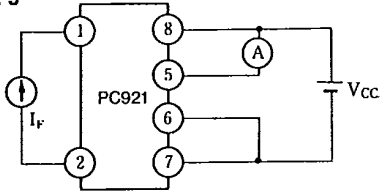


Fig. 4

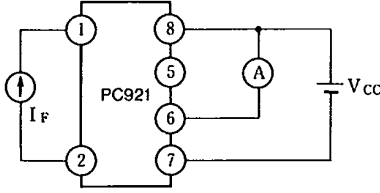


Fig. 5

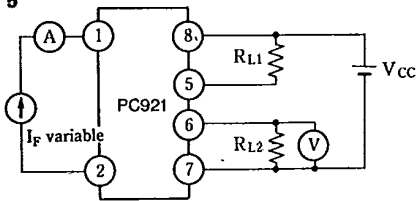


Fig. 6

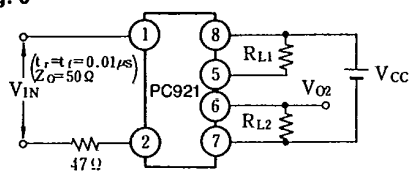


Fig. 7

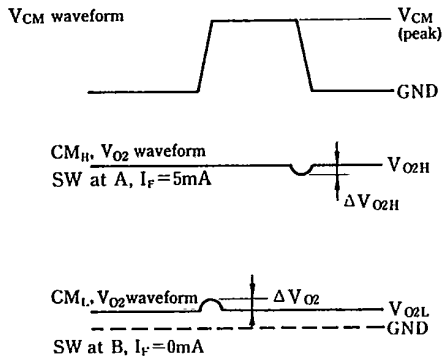
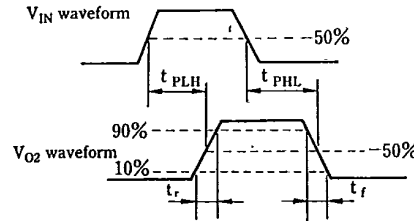
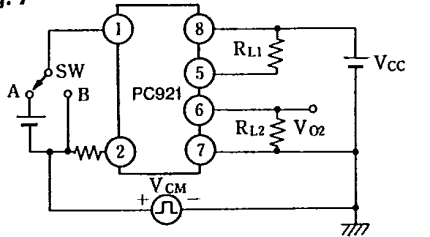
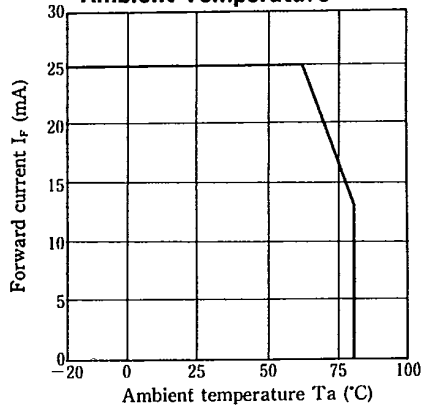
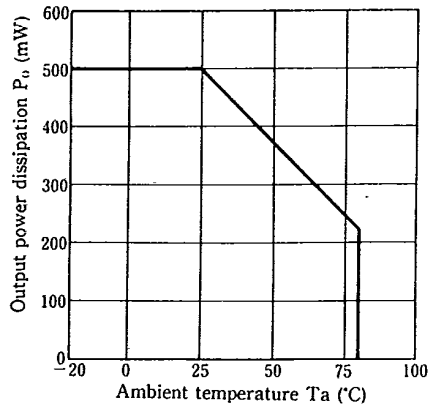


Fig. 8 Forward Current vs. Ambient Temperature

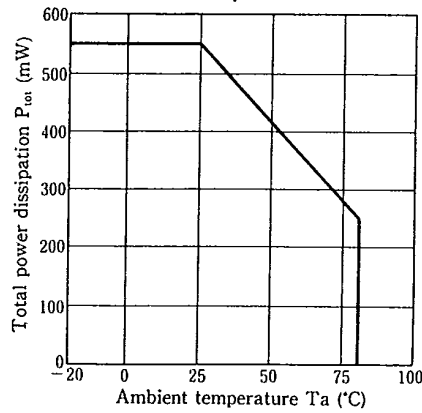


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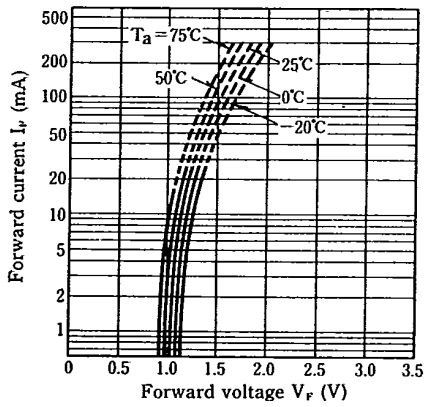
**Fig. 9 Output Power Dissipation vs. Ambient Temperature**



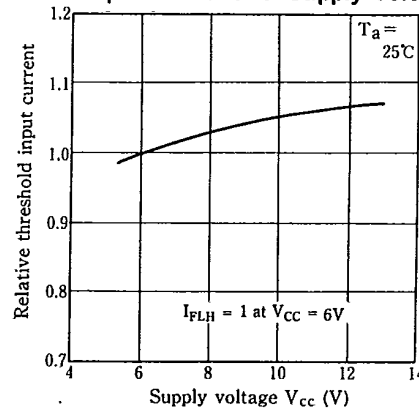
**Fig. 10 Total Power Dissipation P\_tot (mW) vs. Ambient Temperature**



**Fig. 11 Forward Current I\_F vs. Forward Voltage**

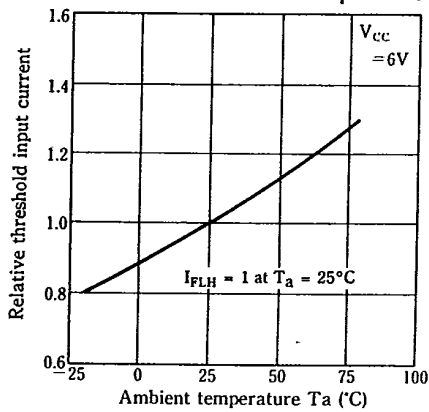


**Fig. 12 "Low → High" Relative Threshold Input Current vs. Supply Voltage**

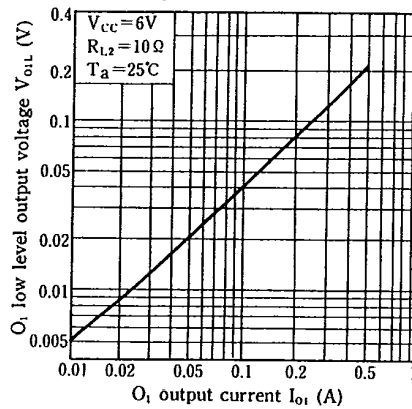


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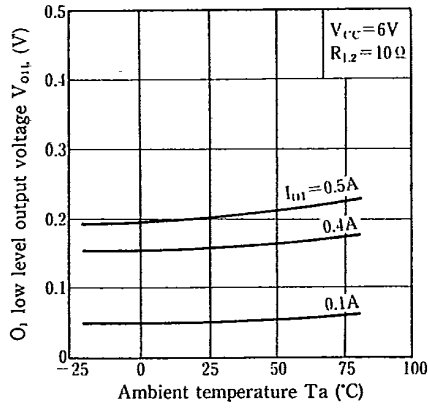
**Fig. 13 "Low → High" Relative Threshold Input Current vs. Ambient Temperature**



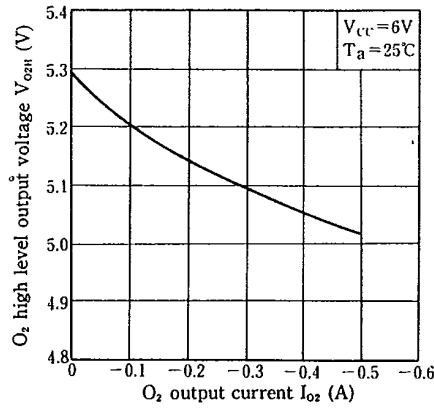
**Fig. 14 O\_1 Low Level Output Voltage vs. O\_1 Output Current**



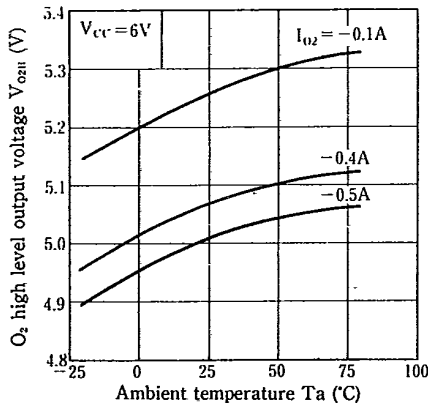
**Fig. 15 O<sub>1</sub> Low Level Output Voltage vs. Ambient Temperature**



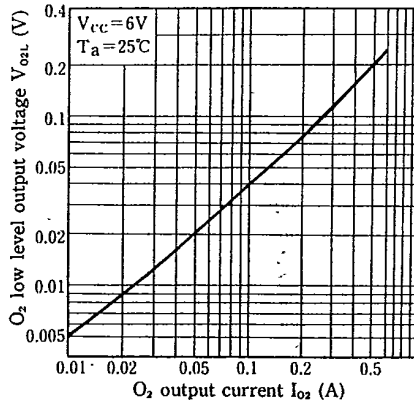
**Fig. 16 O<sub>2</sub> High Level Output Voltage vs. O<sub>2</sub> Output Current**



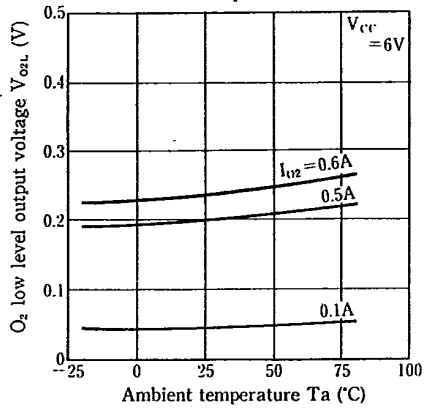
**Fig. 17 O<sub>2</sub> High Level Output Voltage vs. Ambient Temperature**



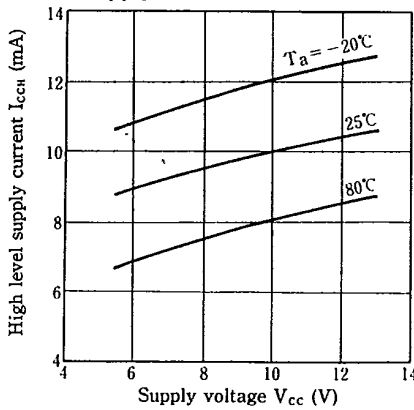
**Fig. 18 O<sub>2</sub> Low Level Output Voltage vs. O<sub>2</sub> Output Current**



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



**Fig. 20 High Level Supply Current vs. Supply Voltage**



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Fig. 21 Low Level Supply Current vs. Supply Voltage

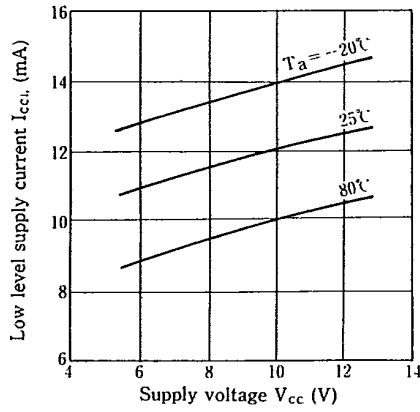


Fig. 22 Propagation Time vs. Forward Current

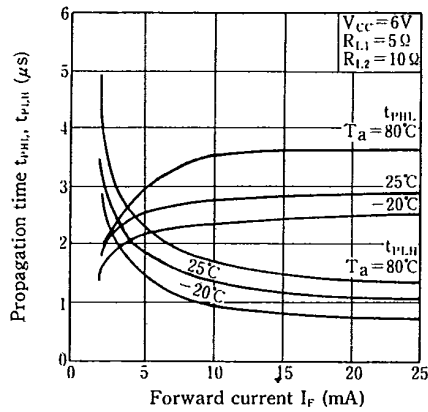


Fig. 23 Propagation Time vs. Ambient Temperature

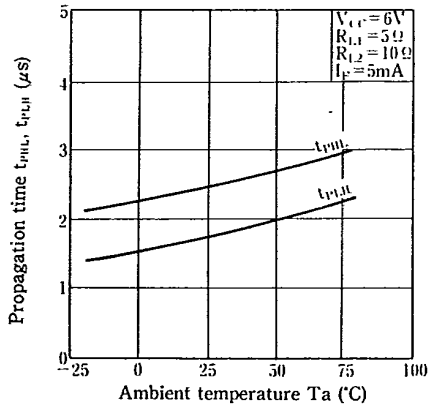
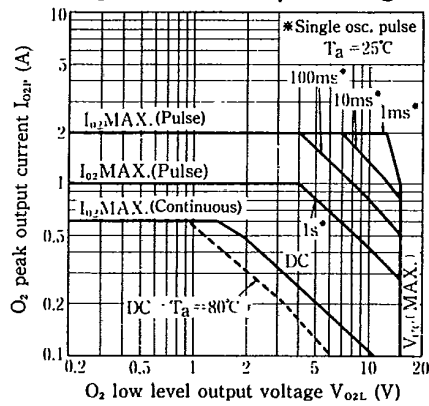


Fig. 24  $O_2$  Peak Output Current vs.  $O_2$  Low Level Output Voltage



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