PC924

OPIC Photocoupler for IGBT Drive of Inverter

※ Lead forming type (I type) and taping reel type (P type) are also available. (**PC924I/PC924P**) (Page 656)

Features

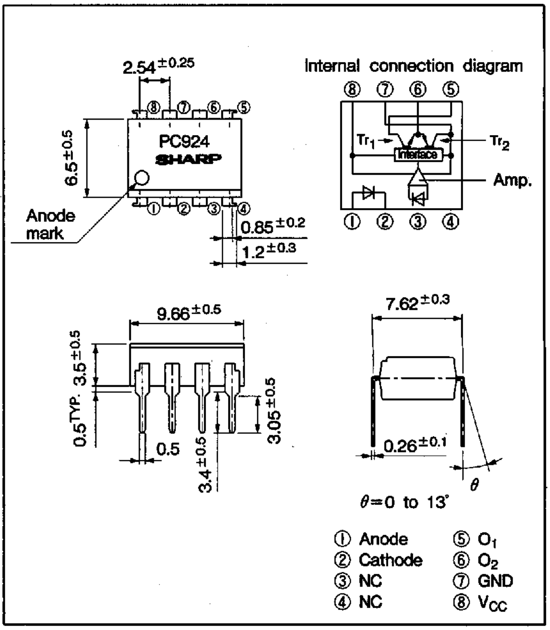
1. Built-in direct drive circuit for IGBT drive (I_{O1P}, I_{O2P} : 0.4A)
2. High speed response (t_{PLH}, t_{PHL} : MAX. 2.0 μs)
3. Wide operating supply voltage range (V_{CC} : 15 to 30V at Ta = −10 to 60℃)
4. High noise resistance type
   CM_H : MIN. −1 500V/μs
   CM_L : MIN. 1 500V/μs
5. High isolation voltage (V_{iso} : 5 000V_{rms})

Applications

1. IGBT drive for inverter control

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

(Unless specified, $Ta = T_{opr}$)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	25	mA
	Reverse voltage	V_R	6	V
Output	Supply voltage	V_{CC}	35	V
	O_1 output current	I_{O1}	0.1	A
	*1 O_1 peak output current	I_{O1P}	0.4	A
	O_2 output current	I_{O2}	0.1	A
	*1 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
*2 Isolation voltage		V_{iso}	5 000	V_{rms}
Operating temperature		T_{opr}	−25 to +80	℃
Storage temperature		T_{stg}	−55 to +125	℃
*3 Soldering temperature		T_{sol}	260	℃

*1 Pulse width ≦ 0.15 μs, Duty ratio 0.01
*2 40 to 60%RH, AC for 1 minute, Ta = 25℃
*3 For 10 seconds

Electro-optical Characteristics

(Ta = T_{opr} unless otherwise specified)

Parameter		Symbol	*4 Conditions	MIN.	TYP.	MAX.	Unit	Fig.
Input	Forward voltage	V_{F1}	Ta=25℃, I_F=20mA	–	1.2	1.4	V	–
		V_{F2}	Ta=25℃, I_F=0.2mA	0.6	0.9	–	V	–
	Reverse current	I_R	Ta=25℃, V_R=4V	–	–	10	μA	–
	Terminal capacitance	C_t	Ta=25℃, V=0, f=1kHz	–	30	250	pF	–
Output	Operating supply voltage	V_{CC}	Ta=−10 to 60℃	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=10mA	–	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=10mA	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℃, V_{CC}=V_{O1}=35V, I_F=0	–	–	500	μA	4
	O_2 leak current	I_{O2L}	Ta=25℃, V_{CC}=V_{O2}=35V, I_F=10mA	–	–	500	μA	5
	High level supply current	I_{CCH}	Ta=25℃, V_{CC}=24V, I_F=10mA	–	6	10	mA	6
			V_{CC}=24V, I_F=10mA	–	–	14	mA	
	Low level supply current	I_{CCL}	Ta=25℃, V_{CC}=24V, I_F=0	–	8	13	mA	
			V_{CC}=24V, I_F=0	–	–	17	mA	
Transfer charac-teristics	*5 "Low→High" threshold input current	I_{FLH}	Ta=25℃, V_{CC}=24V	1.0	4.0	7.0	mA	7
			V_{CC}=24V	0.6	–	10.0	mA	
	Isolation resistance	R_{ISO}	Ta=25℃, DC=500V, 40 to 60%RH	5×10^{10}	10^{11}	–	Ω	–
	Response time: "Low→High" propagation delay time	t_{PLH}	Ta=25℃, V_{CC}=24V, I_F=10mA, R_C=47Ω, C_G=3,000pF	–	1.0	2.0	μs	8
	Response time: "High→Low" propagation delay time	t_{PHL}		–	1.0	2.0	μs	
	Response time: Rise time	t_r		–	0.2	0.5	μs	
	Response time: Fall time	t_f		–	0.2	0.5	μs	
	Instantaneous common mode rejection voltage "Output : High level"	CM_H	Ta=25℃, V_{CM}=600V(peak), I_F=10mA, V_{CC}=24V, ΔV_{O2H}=2.0V	−1 500	–	–	V/μs	9
	Instantaneous common mode rejection voltage "Output : Low level"	CM_L	Ta=25℃, V_{CM}=600V(peak), I_F=0, V_{CC}=24V, ΔV_{O2L}=2.0V	1 500	–	–	V/μs	

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

■ Test Circuit

Fig. 1

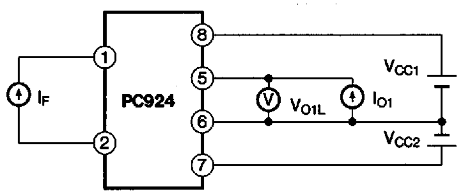


Fig. 2

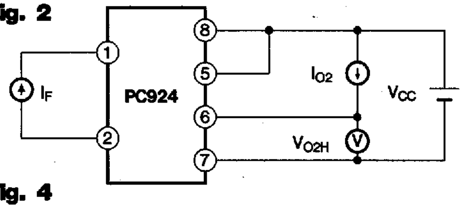


Fig. 3

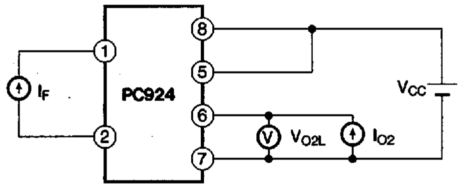


Fig. 4

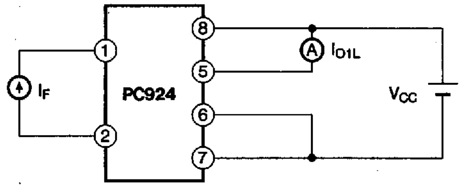


Fig. 5

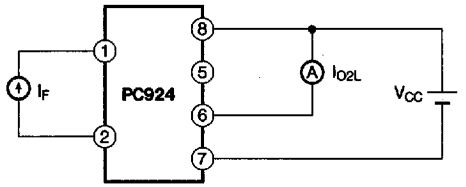


Fig. 6

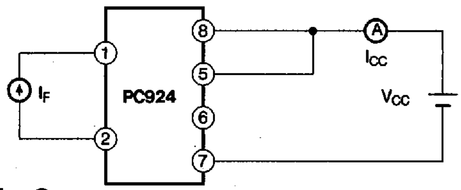


Fig. 7

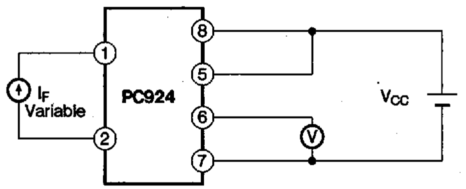


Fig. 8

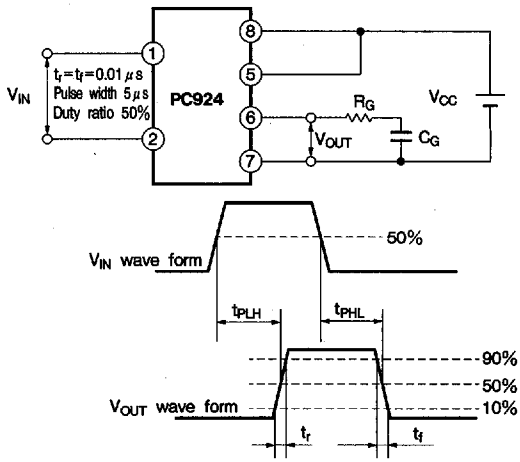


Fig. 9

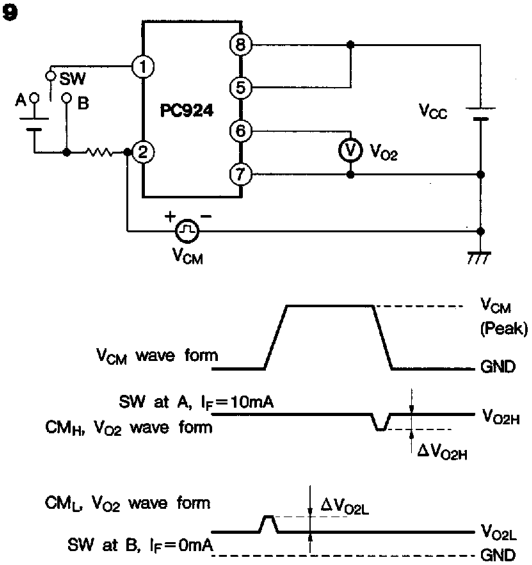


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Fig.10 Forward Current vs. Ambient Temperature

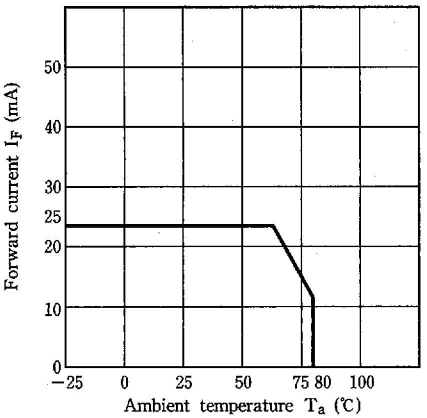

Fig.11 Power Dissipation vs. Ambient Temperature

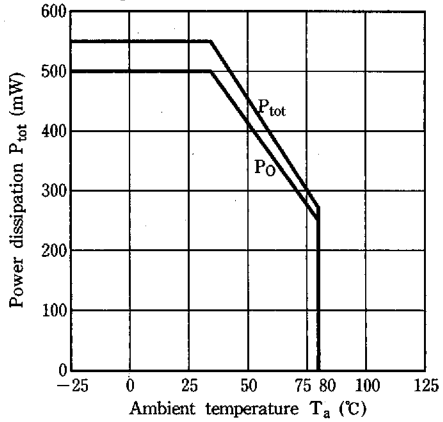

Fig.12 Forward Current vs. Forward Voltage

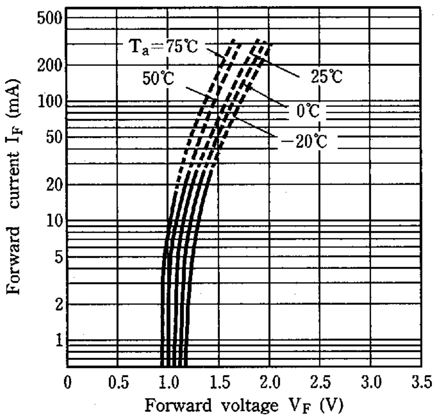

Fig.13 Relative Threshold Input Current vs. Supply Voltage

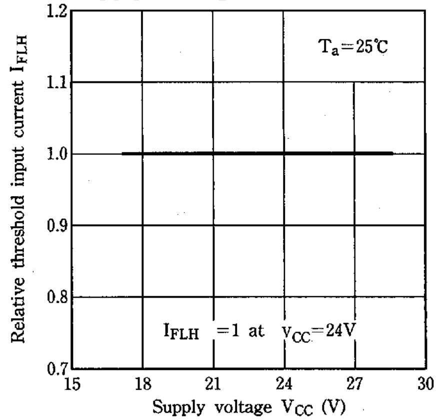

Fig.14 Relative Threshold Input Current vs. Ambient Temperature

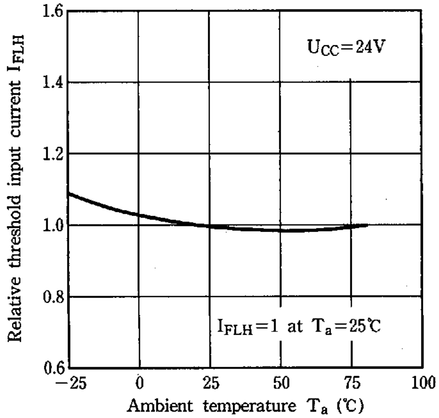

Fig.15 O_1 Low Level Output Voltage vs. O_1 Output Current

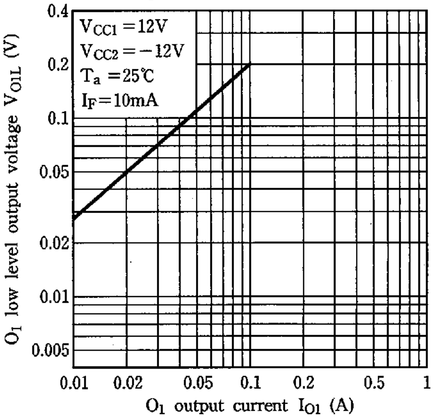

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Fig.16 O_1 Low Level Output Voltage vs. Ambient Temperature

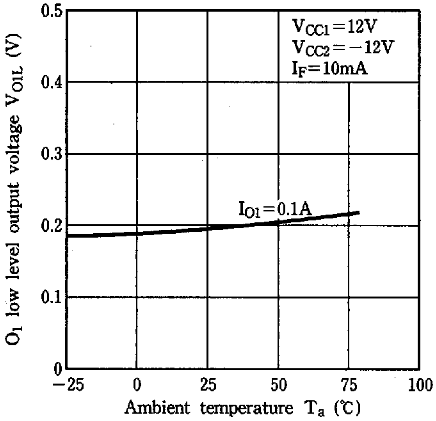


Fig.17 O_2 High Level Output Voltage vs. Supply Voltage

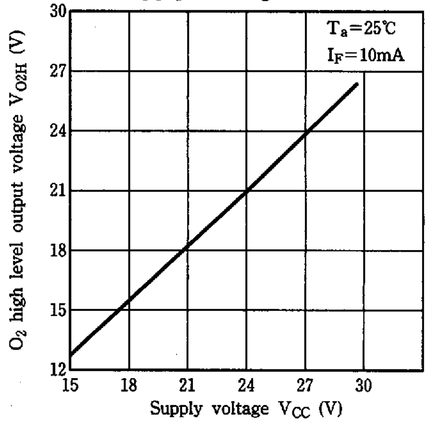


Fig.18 O_2 High Level Output Voltage vs. Ambient Temperature

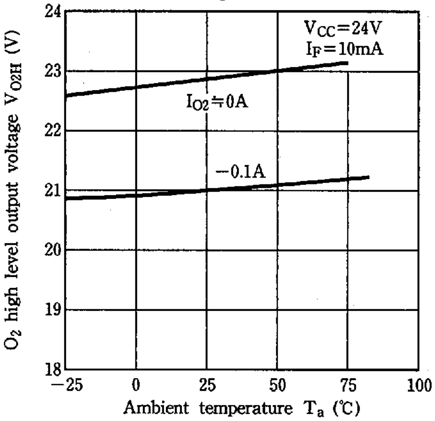


Fig.19 O_2 Low Level Output Voltage vs. O_2 Output Current

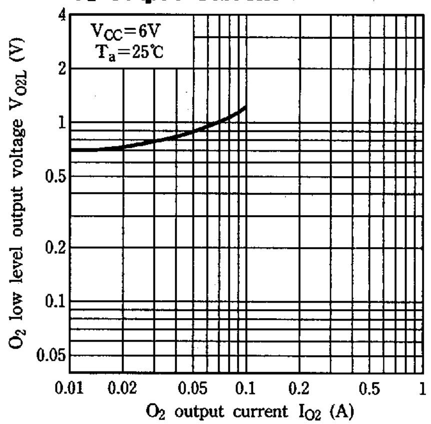


Fig.20 O_2 Low Level Output Voltage vs. Ambient Temperature

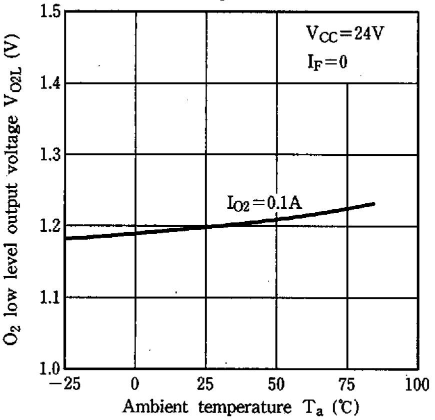


Fig.21 High Level Supply Current vs. Supply Voltage

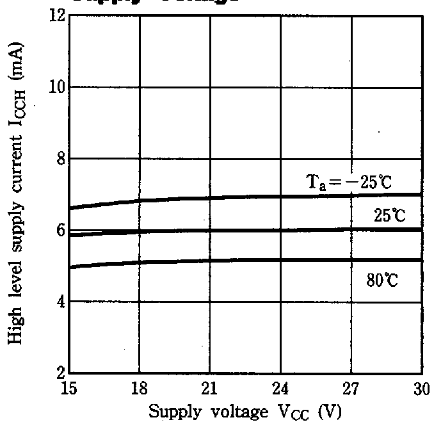


Fig.22 Low Level Supply Current vs. Supply Voltage

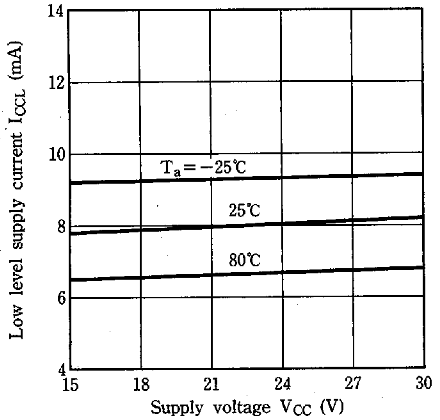


Fig.23 Propagation Delay Time vs. Forward Current

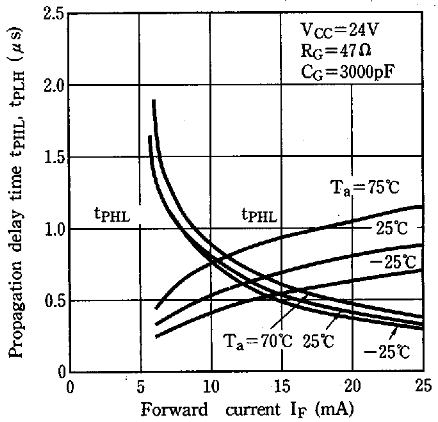
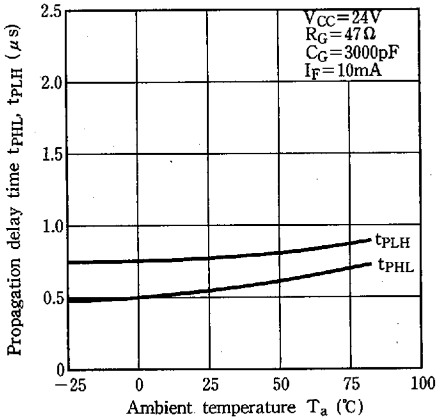
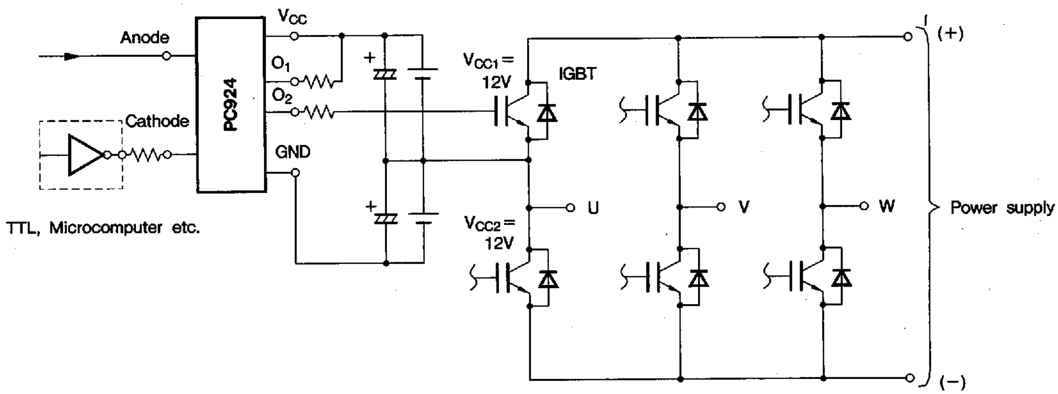


Fig.24 Propagation Delay Time vs. Ambient Temperature



■ Application Circuit (IGBT Drive for Inverter)



● Please refer to the chapter "Precautions for Use" (Page 78 to 93).