PC930 Series

Digital Output, High Sensitivity Type OPIC Photocoupler

■ Features

1. High sensitivity
   (I_{FLH}, I_{FHL} : MAX. 1mA)
2. TTL and LSTTL compatible output
3. Operating supply voltage range
   (V_{CC} : 4.5 to 15V, **PC930/PC931/PC932/PC933**)
4. Various output forms
   (Open collector output, pull-up resistor built-in type, totem pole output)
5. Low output current dissipation
   (I_{CCL} : MAX. 3.8mA)
6. High isolation voltage between input and output (V_{iso} : 5 000V_{rms})
7. Recognized by UL, file No. E64380

■ Model Line-up

	Open collector output type	Pull-up resistor built-in type	Totem pole output type
Low active	**PC930**	**PC932**	**PC934**
High active	**PC931**	**PC933**	**PC935**

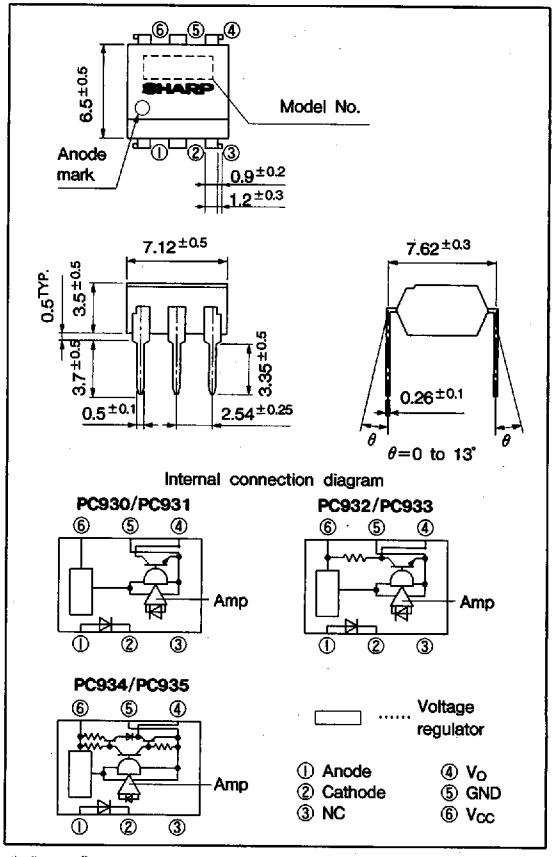
■ Applications

1. Computer terminals
2. High speed line receivers
3. Interfaces with various data transmission equipment

■ Absolute Maximum Ratings

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	20	mA
	*1Peak forward current		I_{FM}	1	A
	Reverse voltage		V_R	6	V
	Power dissipation		P	70	mW
Output	Supply voltage	PC930/PC931	V_{CC}	−0.5 to 16.0	V
		PC932/PC933			
		PC934/PC935		−0.5 to 7.0	
	High level output voltage	PC930/PC931	V_{OH}	−0.5 to 16.0	V
	High level output current	PC934/PC935	I_{OH}	−800	μA
	Low level output current		I_{OL}	50	mA
	Power dissipation		P_O	150	mW
Total power dissipation			P_{tot}	170	mW
*2Isolation voltage			V_{iso}	5 000	V_{rms}
Operating temperature			T_{opr}	−25 to +85	°C
Storage temperature			T_{stg}	−40 to +125	°C
*3Soldering temperature			T_{sol}	260	°C

■ 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.

*1 Pulse width ≤ 100 μs
Duty ratio = 0.001
*2 40 to 60%RH,
AC for 1 minute
*3 For 10 seconds

■ Electro-optical Characteristics

(Ta=0 to +70℃ unless otherwise specified.)

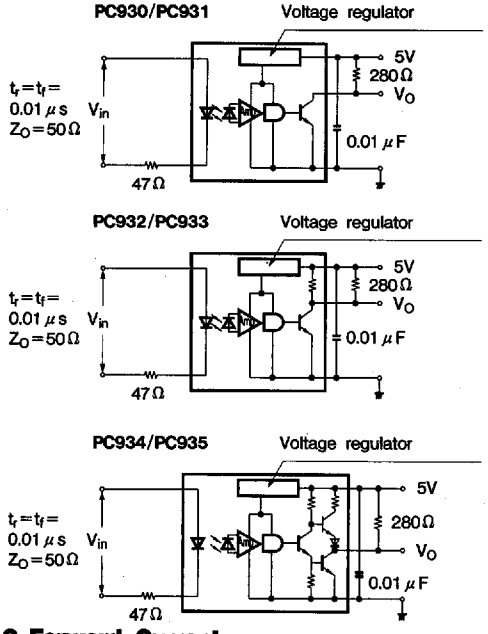
Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=2mA	–	1.1	1.4	V
				I_F=0.1mA	0.55	0.95	–	V
	Reverse current		I_R	Ta=25℃, V_R=3V	–	–	10	μA
	Terminal capacitance		C_t	Ta=25℃, V=0, f=1kHz	–	30	250	pF
Output	Operating supply voltage	PC930/PC931 PC932/PC933	V_{CC}		4.5	–	15	V
		PC934/PC935			4.5		5.5	V
	Low level output voltage	PC930/PC932	V_{OL}	I_{OL}=16mA, V_{CC}=5V, I_F=1mA	–	0.15	0.4	V
		PC931/PC933		I_{OL}=16mA, V_{CC}=5V, I_F=0				
		PC934		I_{OL}=16mA, V_{CC}=4.5V, I_F=1mA				
		PC935		I_{OL}=16mA, V_{CC}=4.5V, I_F=0				
	High level output voltage	PC932	V_{OH}	V_{CC}=5V, I_F=0	3.5	–	–	V
		PC933		V_{CC}=5V, I_F=1mA				
		PC934		V_{CC}=4.5V, I_F=0, I_{OH}=−400μA	2.4	–	–	V
		PC935		V_{CC}=4.5V, I_F=1mA, I_{OH}=−400μA				
	High level output current	PC930	I_{OH}	V_{CC}=V_O=15V, I_F=0	–	–	100	μA
		PC931		V_{CC}=V_O=15V, I_F=1mA	–	–	100	
	Low level supply current	PC930	I_{CCL}	V_{CC}=5V, I_F=1mA	–	1.3	3.4	mA
		PC931		V_{CC}=5V, I_F=0	–	1.3	3.4	mA
		PC932/PC934		V_{CC}=5V, I_F=1mA	–	1.7	3.8	mA
		PC933/PC935		V_{CC}=5V, I_F=0	–	1.7	3.8	mA
	High level supply current	PC930/PC932 PC934	I_{CCH}	V_{CC}=5V, I_F=0	–	0.7	2.2	mA
		PC931/PC933 PC935		V_{CC}=5V, I_F=1mA				
	Output short circuit current	PC934	I_{OS}	V_{CC}=5V, I_F=0, T=Within 1 second	6	17	35	mA
		PC935		V_{CC}=5V, I_F=1mA, T=Within 1 second				
Transfer characteristics	*4 "High→Low" Threshold input current	PC930/PC932 PC934	I_{FHL}	V_{CC}=5V, R_L=280Ω	–	0.5	1.0	mA
		PC931/PC933 PC935			0.1	0.4	–	mA
	*5 "Low→High" Threshold input current	PC930/PC932 PC934	I_{FLH}	V_{CC}=5V, R_L=280Ω	0.1	0.4	–	mA
		PC931/PC933 PC935			–	0.5	1.0	mA
	*6 Hysteresis	PC930/PC932 PC934	I_{FLH}/I_{FHL}	V_{CC}=5V, R_L=280Ω	–	0.8	–	–
		PC931/PC933 PC935	I_{FHL}/I_{FLH}					
	Isolation resistance		R_{ISO}	Ta=25℃, DC500V, 40 to 60%RH	5×10^{10}	10^{11}	–	Ω
	Response time: "High→Low" propagation delay time	PC930/PC932 PC934	t_{PHL}	Ta=25℃ V_{CC}=5V I_F=1mA R_L=280Ω Fig.1	–	3	9	μs
		PC931/PC933 PC935			–	5	15	
	Response time: "Low→High" propagation delay time	PC930/PC932 PC934	t_{PLH}		–	5	15	
		PC931/PC933 PC935			–	3	9	
	Response time: Fall time		t_f		–	0.05	0.5	
	Response time: Rise time		t_r		–	0.1	0.5	

*4 I_{FHL} represents forward current when output goes from high to low.
*5 I_{FLH} represents forward current when output goes from low to high.
*6 Hysteresis stands for I_{FLH}/I_{FHL}.

■ Recommended Operating Conditions

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
Low level output current		I_{OL}	–	1.6	16	mA
High level output current	PC934/PC935	I_{OH}	–	–	−400	μA
Supply voltage	PC930/PC931 PC932/PC933	V_{CC}	4.5	5.0	15.0	V
	PC934/PC935		4.5	5.0	5.5	V
Operating temperature		T_{opr}	0	25	70	℃

Fig. 1 Test Circuit for t_{PHL}, t_{PLH}, t_r, t_f



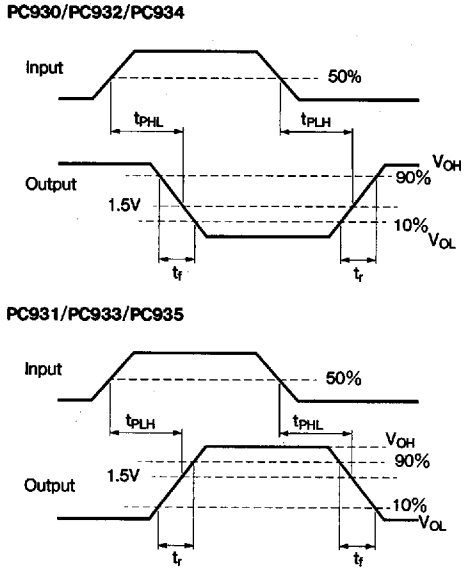


Fig. 2 Forward Current vs. Ambient Temperature

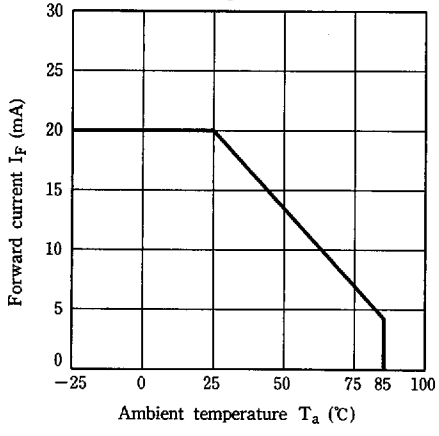


Fig. 3 Power Dissipation vs. Ambient Temperature

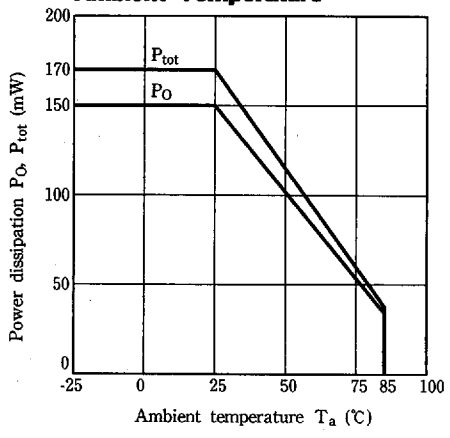


Fig. 4 Forward Current vs. Forward Voltage

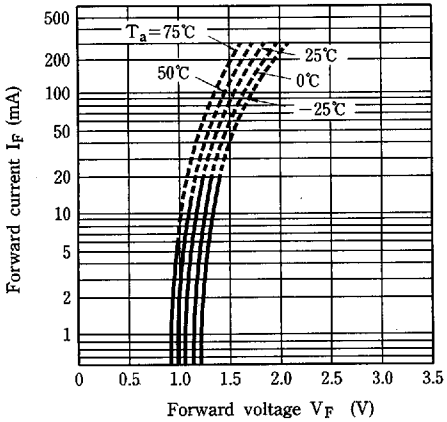


Fig. 5-a Relative Threshold Input Current vs. Supply Voltage

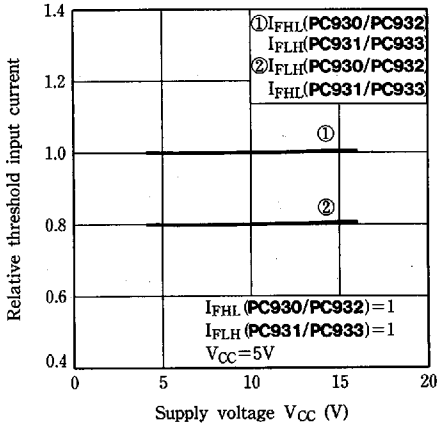


Fig. 5-b Relative Threshold Input Current vs. Supply Voltage

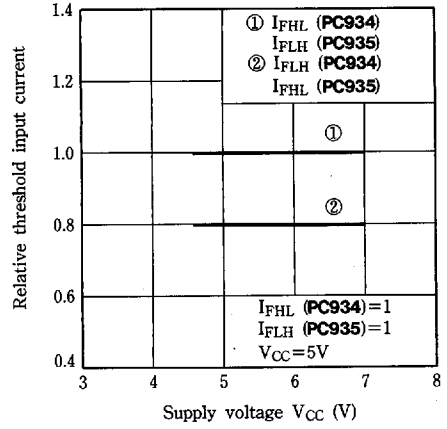


Fig. 6 Relative Threshold Input Current vs. Ambient Temperature

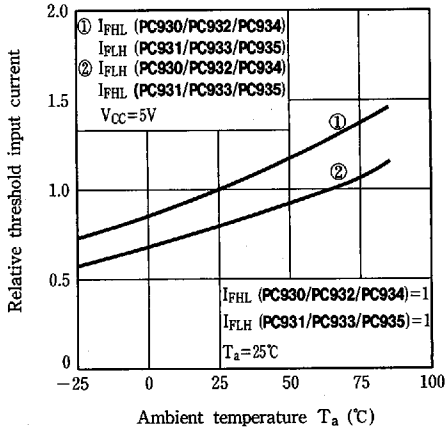


Fig. 7 Low Level Output Voltage vs. Low Level Output Current

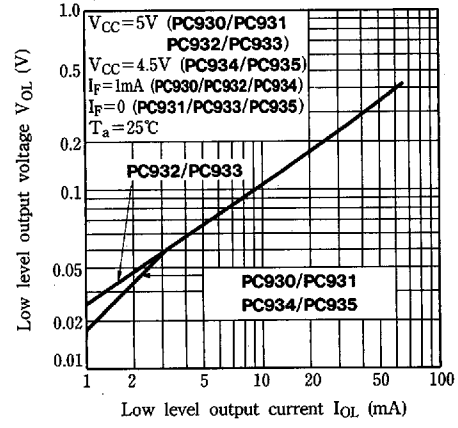


Fig. 8 Low Level Output Voltage vs. Ambient Temperature

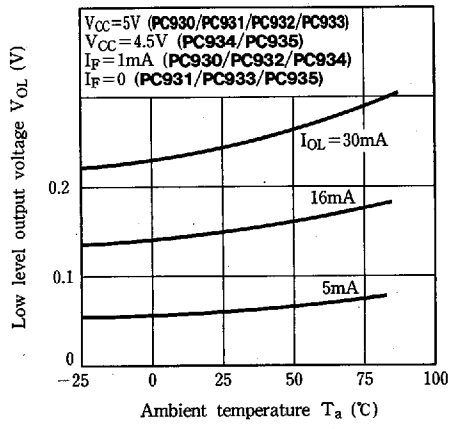


Fig. 9-a Supply Current vs. Supply Voltage (PC930/PC931)

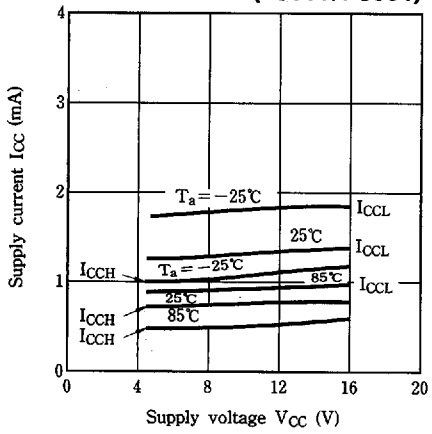


Fig. 9-b Supply Current vs. Supply Voltage (PC932/PC933)

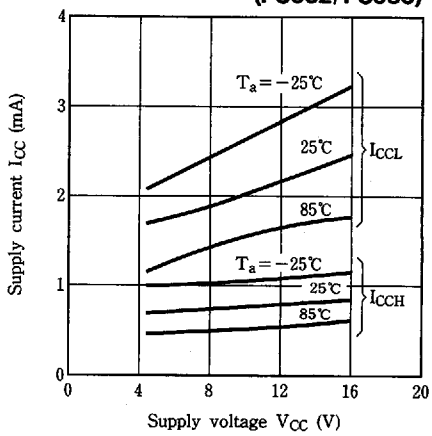


Fig. 9-c Supply Current vs. Supply Voltage (PC934/PC935)

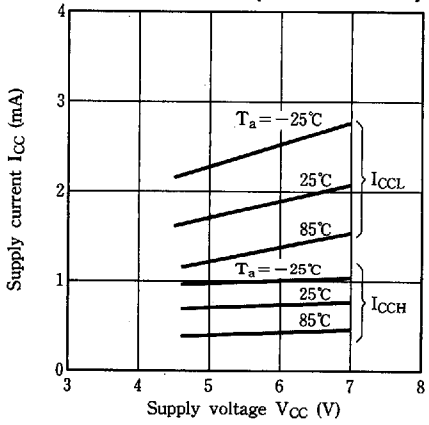


Fig.10 Propagation Delay Time vs. Forward Current

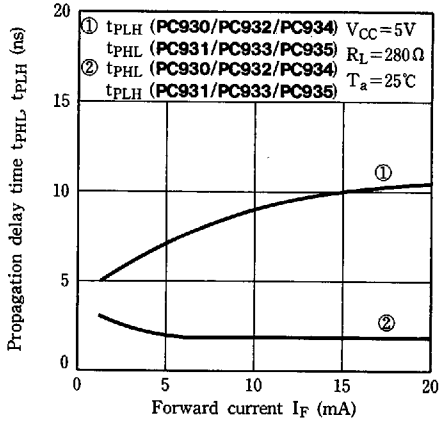


Fig.11-a Rise Time, Fall Time vs. Load Resistance (PC930/PC931)

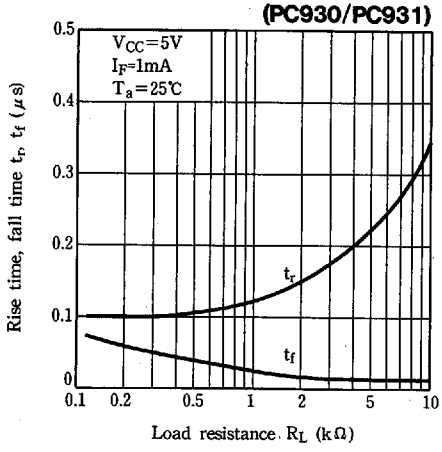


Fig.11-b Rise Time, Fall Time vs. Load Resistance (PC932/PC933)

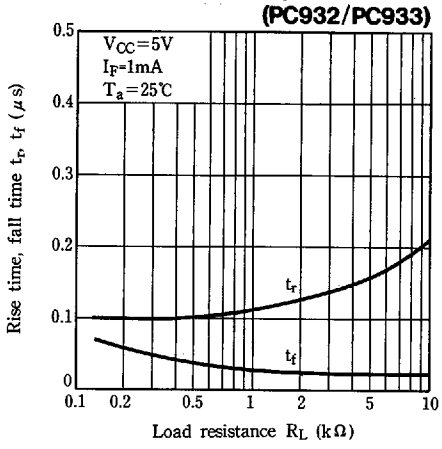
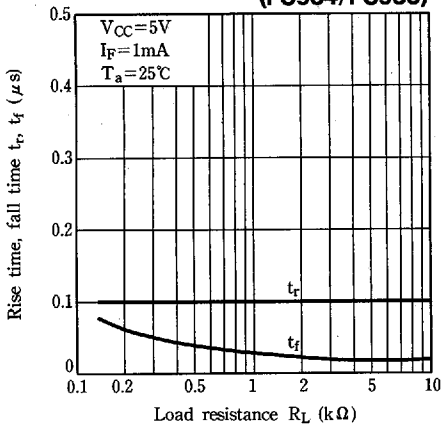


Fig.11-c Rise Time, Fall Time vs. Load Resistance (PC934/PC935)



■ Precautions for Use

(1) It is recommended that a by-pass capacitor of more than 0.01 μF is added between V_{CC} and GND near the device in order to stabilize power supply line.

(2) Handle this product the same as with other integrated circuits against static electricity.

(3) As for other general cautions, refer to the chapter "Precautions for Use." (Page 78 to 93)