

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

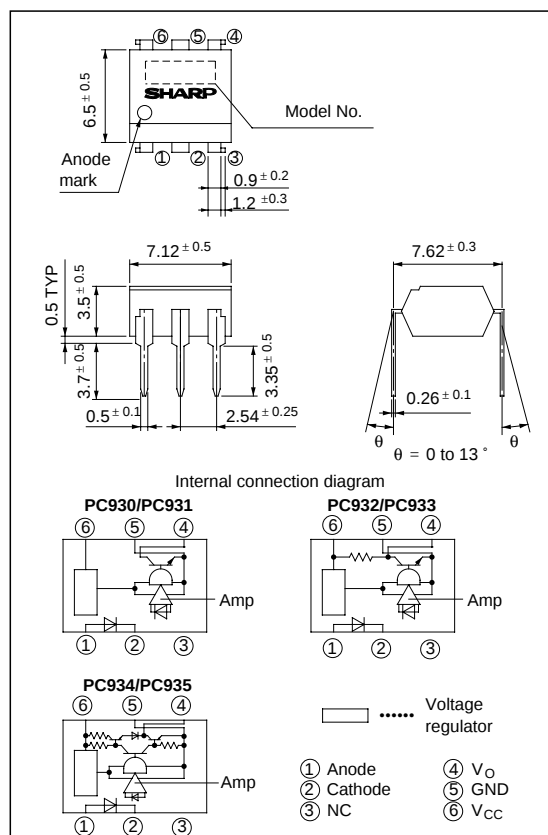
1. Computer terminals
2. High speed line receivers
3. Interfaces with various data transmission equipment

■ Absolute Maximum Ratings

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	20	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Supply voltage	V_{CC}	- 0.5 to 16.0	V
	High level output voltage	V_{OH}	- 0.5 to 16.0	V
	High level output current	I_{OH}	- 800	μ A
	Low level output current	I_{OL}	50	mA
	Power dissipation	P_O	150	mW
	Total power dissipation	P_{tot}	170	mW
	*2 Isolation voltage	V_{iso}	5 000	V _{rms}
	Operating temperature	T_{opr}	- 25 to + 85	°C
	Storage temperature	T_{stg}	- 40 to + 125	°C
	*3 Soldering 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 $\leq 100 \mu$ s

Duty ratio : 0.001

*2 40 to 60% RH,

AC for 1 minute

*3 For 10 seconds

■ Electro-optical Characteristics

(Ta = 0 to + 70°C 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°C, V _R = 3V	-	-	10	μ A	
	Terminal capacitance		C _t	Ta = 25°C, 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} = - 400 μ A	2.4	-	-	V	
		PC935		V _{CC} = 4.5V, I _F = 1mA, I _{OH} = - 400 μ A					
	High level output current	PC930	I _{OH}	V _{CC} = V _O = 15V, I _F = 0	-	-	100	μ A	
		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		
		PC932/PC934		V _{CC} = 5V, I _F = 1mA	-	1.7	3.8		
		PC933/PC935		V _{CC} = 5V, I _F = 0	-	1.7	3.8		
	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 = 280 Ω	-	0.5	1.0	mA	
		PC931/PC933 PC935			0.1	0.4	-		
	*5“ Low→High” Threshold input current	PC930/PC932 PC934	I _{FLH}	V _{CC} = 5V, R _L = 280 Ω	0.1	0.4	-	mA	
		PC931/PC933 PC935			-	0.5	1.0		
	*6Hysteresis	PC930/PC932 PC934	I _{FLH} / I _{FHL}	V _{CC} = 5V, R _L = 280 Ω	-	0.8	-	-	
		PC931/PC933 PC935	I _{FHL} / I _{FLH}						
	Isolation resistance			R _{ISO}	Ta = 25°C, DC500V, 40 to 60% RH	5 x 10 ¹⁰	10 ¹¹	-	Ω
	Response time	“ High→Low” propagation delay time	PC930/PC932 PC934	t _{PHL}	Ta = 25°C V _{CC} = 5V I _F = 1mA R _L = 280Ω Fig.1	-	3	9	μ s
			PC931/PC933 PC935			-	5	15	
		“ Low→High” propagation delay time	PC930/PC932 PC934	t _{PLH}		-	5	15	
			PC931/PC933 PC935			-	3	9	
		Fall time		t _f		-	0.05	0.5	
		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	μ A
	PC930/PC931 PC932/PC933	V_{CC}	4.5	5.0	15.0	V
Supply voltage	PC934/PC935	V_{CC}	4.5	5.0	5.5	V
	Operating temperature	T_{opr}	0	25	70	$^{\circ}$ C

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

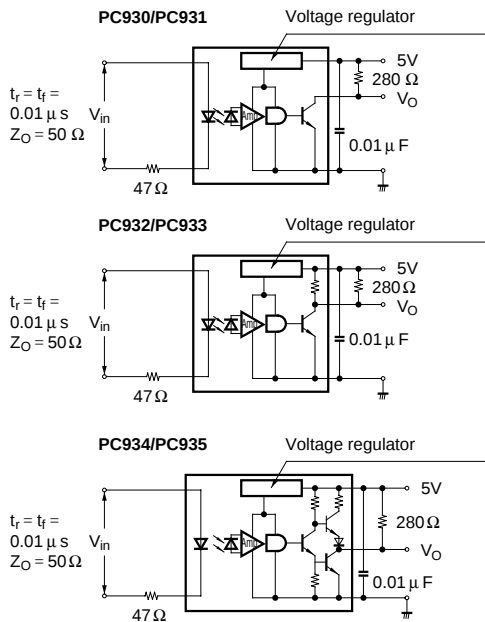
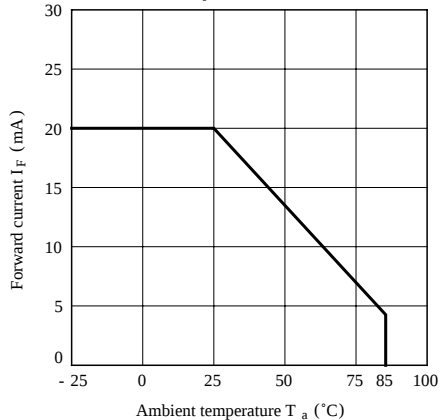
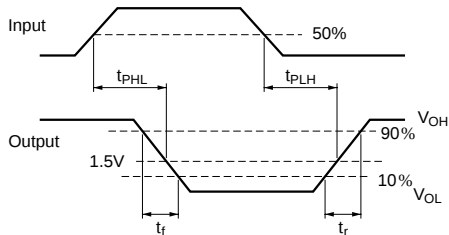


Fig. 2 Forward Current vs. Ambient Temperature



PC930/PC932/PC934



PC931/PC933/PC935

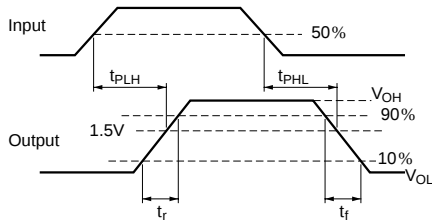


Fig. 3 Power Dissipation vs. Ambient Temperature

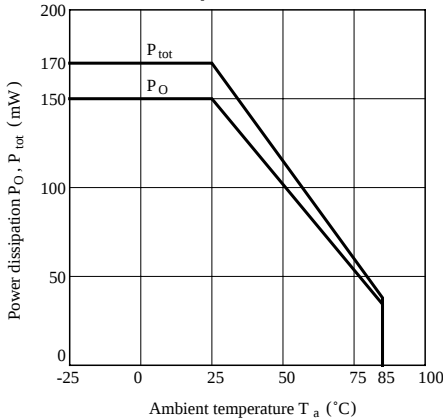


Fig. 4 Forward Current vs. Forward Voltage

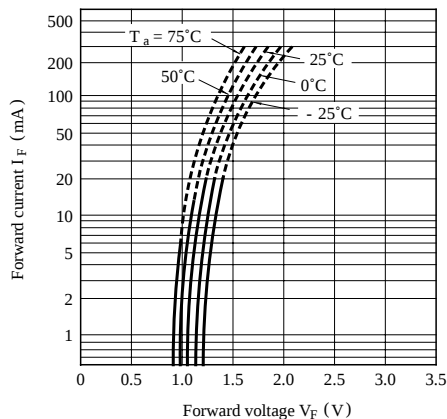


Fig. 5-b Relative Threshold Input Current vs. Supply Voltage

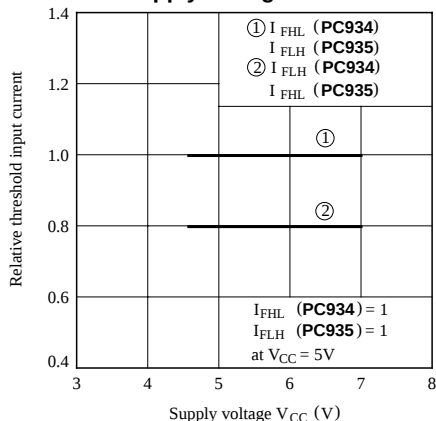


Fig. 7 Low Level Output Voltage vs. Low Level Output Current

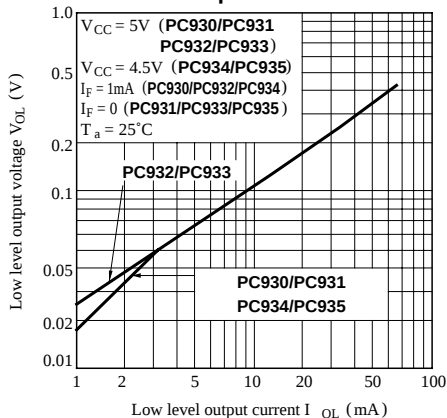


Fig. 5-a Relative Threshold Input Current vs. Supply Voltage

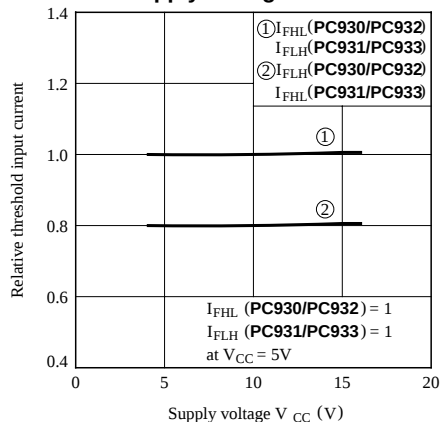


Fig. 6 Relative Threshold Input Current vs. Ambient Temperature

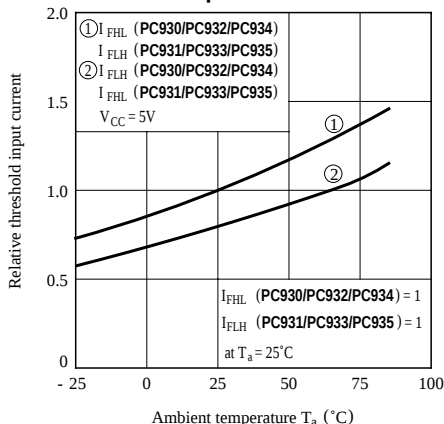
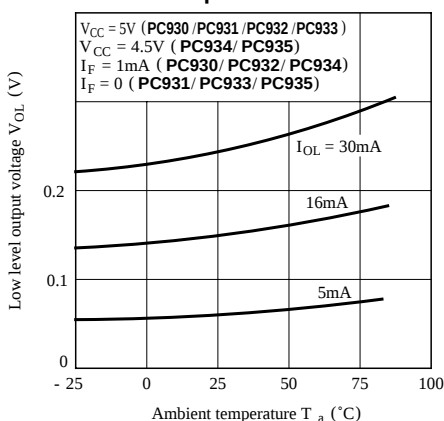
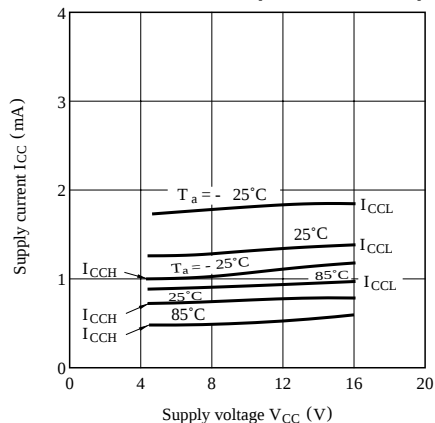


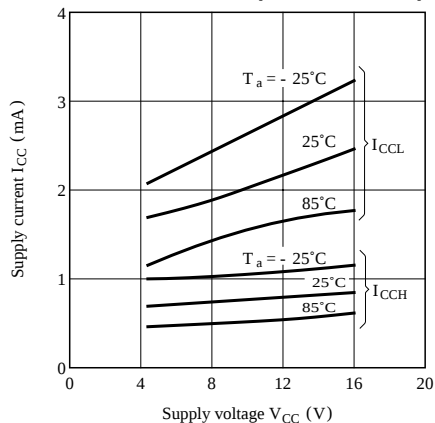
Fig. 8 Low Level Output Voltage vs. Ambient Temperature



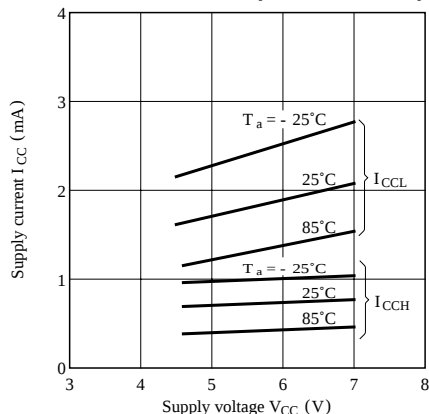
**Fig. 9-a Supply Current vs. Supply Voltage
(PC930/PC931)**



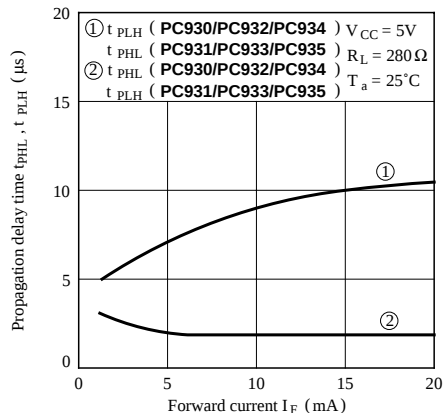
**Fig. 9-b Supply Current vs. Supply Voltage
(PC932/PC933)**



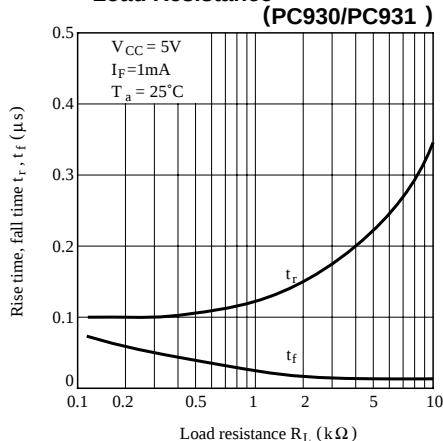
**Fig. 9-c Supply Current vs. Supply Voltage
(PC934/PC935)**



**Fig.10 Propagation Delay Time vs.
Forward Current**



**Fig.11-a Rise Time, Fall Time vs.
Load Resistance**



**Fig.11-b Rise Time, Fall Time vs.
Load Resistance**

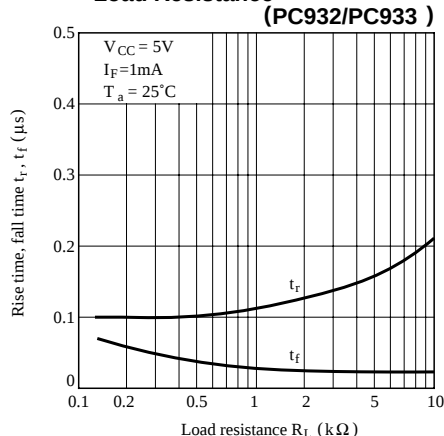
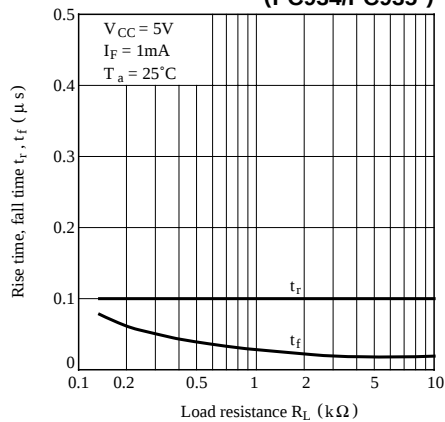


Fig.11-c Rise Time, Fall Time vs.
Resistance Load

(PC934/PC935)



■ Precautions for Use

- (1) It is recommended that a by-pass capacitor of more than $0.01 \mu F$ 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".