

SHARP ELEK/ MELEC DIV 15E D 8180798 0003067 4

Photointerrupter

T-41-73

GP1A06

# GP1A06 2-phase Digital Output Type OPIC Photointerrupter

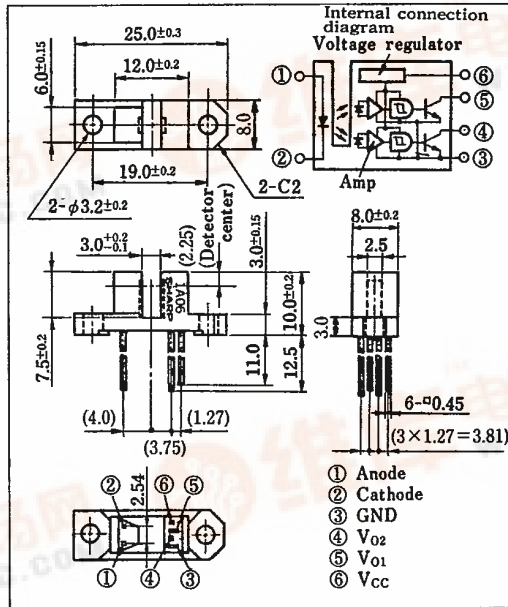
## Features

1. Built-in Schmidt trigger circuit
2. 2-phase digital output with phase difference
3. LSTTL and TTL compatible output
4. Operating supply voltage  $V_{CC}$ : 4.5~16V

## Applications

1. Tape counters in VCRs and cassette tape recorders
2. Copiers, facsimiles
3. Industrial robots, NC machines
4. Electronic scales

## 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

( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Rating	Unit
Forward current	$I_F$	50	mA
*1 Peak forward current	$I_{FM}$	1	A
Reverse voltage	$V_R$	6	V
Power dissipation	$P$	75	mW
Supply voltage	$V_{CC}$	16	V
Low level output current	$I_{OL}$	20	mA
High level output voltage	$V_{OH}$	20	V
Power dissipation	$P_o$	250	mW
Operating temperature	$T_{opr}$	-20 ~ +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-40 ~ +100	$^\circ\text{C}$
*2 Soldering temperature	$T_{sol}$	260	$^\circ\text{C}$

\*1 Pulse width  $\leq 100\mu\text{s}$ , Duty ratio = 0.01

\*2 For 5 seconds

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Electro-optical Characteristics

(Ta=0~+70°C unless specified)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Input	Forward voltage	$V_F$	Ta=25°C, $I_F=20\text{mA}$	—	1.2	1.4	V	
	Reverse current	$I_R$	Ta=25°C, $V_R=3\text{V}$	—	—	10	$\mu\text{A}$	
Output	Operating supply voltage	$V_{CC}$	Ta=25°C	4.5	—	16	V	
	Low level output voltage	$V_{OL}$	$I_{OL}=16\text{mA}$ , $V_{CC}=5\text{V}$ , $I_F=20\text{mA}$	—	0.2	0.4	V	
	High level output current	$I_{OH}$	$V_O=20\text{V}$ , $V_{CC}=16\text{V}$ , $I_F=0$	—	—	100	$\mu\text{A}$	
	Supply current	$I_{CC}$	$V_{CC}=5\text{V}$	—	7.0	15	mA	
Transfer characteristics	*3 "High→Low" threshold input current	$I_{FIL}$	Ta=25°C, $V_{CC}=5\text{V}$ , $R_L=280\Omega$	—	3.0	15	mA	
			$V_{CC}=5\text{V}$ , $R_L=280\Omega$	—	—	20		
	*4 "Low→High" threshold input current	$I_{FLH}$	Ta=25°C, $V_{CC}=5\text{V}$ , $R_L=280\Omega$	0.4	1.8	—	mA	
			$V_{CC}=5\text{V}$ , $R_L=280\Omega$	0.3	—	—		
	Response time	"High→Low" propagation time	$t_{PHL}$	Ta=25°C $V_{CC}=5\text{V}$ $I_F=20\text{mA}$ $R_L=280\Omega$	—	1.0	5.0	$\mu\text{s}$
		"Low→High" propagation time	$t_{PLH}$		—	2.0	10	
Rise time		$t_r$	—		0.1	0.5		
Fall time		$t_f$	—		0.1	0.5		
*5 Output delay time		$t_{d12}$	1.0		—	—		

- \*3  $I_{FIL}$  represents forward current when output goes from high to low.
- \*4  $I_{FLH}$  represents forward current when output goes from low to high.
- \*5  $t_{d12}$  represents the delay time between  $V_{O1}$  and  $V_{O2}$  output. The disk shall be rotated at the speed of 1,000 pulse/sec, and the slit width, slit length and distance between slits are all 2.0 mm.

Fig. 1 Forward Current vs. Ambient Temperature

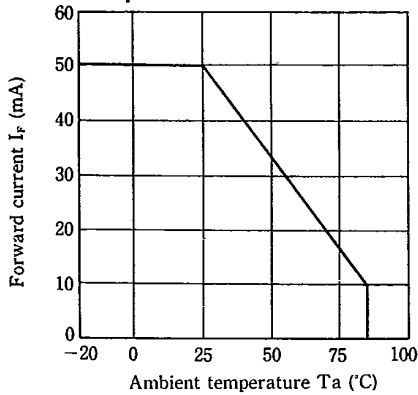


Fig. 2 Output Power Dissipation vs. Ambient Temperature

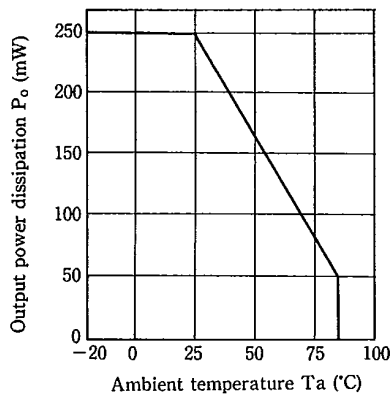


Fig. 3 Forward Current vs. Forward Voltage

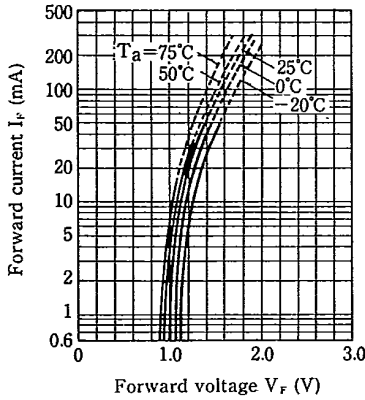


Fig. 4 Relative Threshold Input Current vs. Supply Voltage

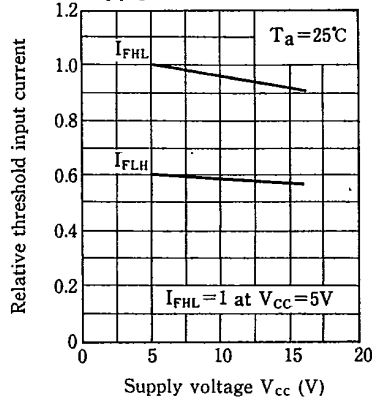


Fig. 5 Relative Threshold Input Current vs. Ambient Temperature

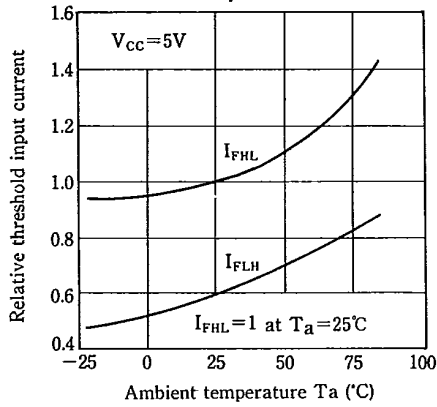


Fig. 6 Low Level Output Voltage vs. Low Level Output Current

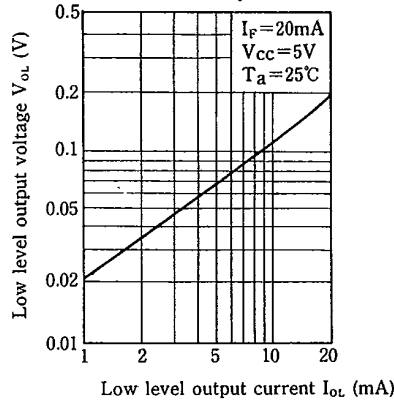


Fig. 7 Low Level Output Voltage vs. Ambient Temperature

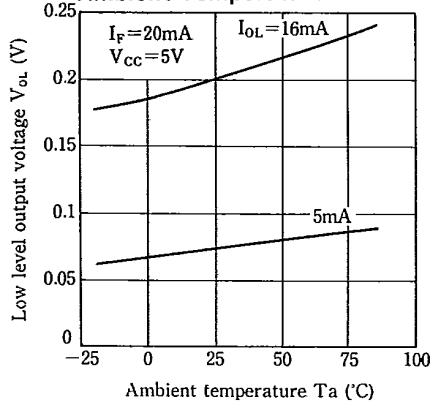
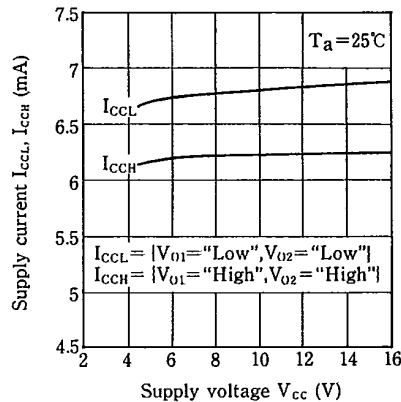


Fig. 8 Supply Current vs. Supply Voltage



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Fig. 9 Propagation Time vs. Forward Current

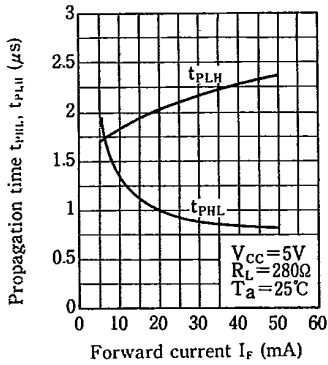
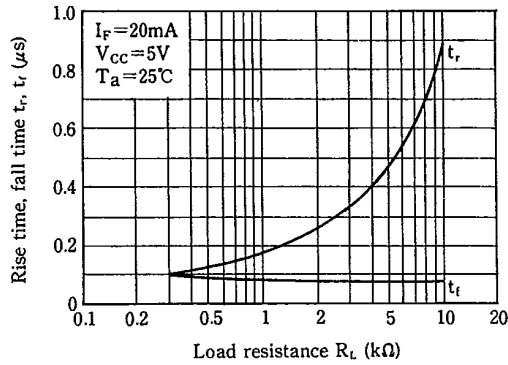
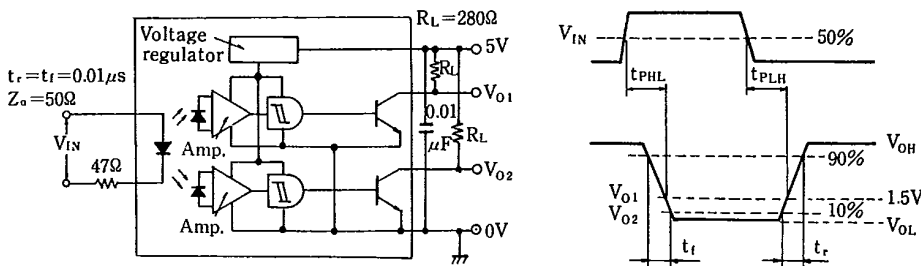


Fig. 10 Rise, Time, Fall Time vs. Load Resistance



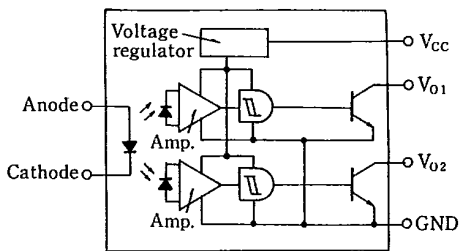
Test Circuit for Response Time



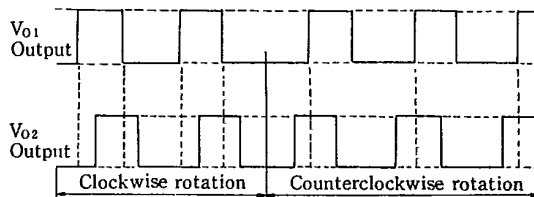
Explanation of Operation

When the forward current which is over the threshold input current ( $I_{FHL}$ ) is supplied;

- (1)  $V_{O1}$  and  $V_{O2}$  output will turn to high level when some objects cut off the luminous flux between LED and detector. It will turn to low level without object.
- (2) When a rotating disk is used, the operation diagram of  $V_{O1}$  and  $V_{O2}$  output is shown below.



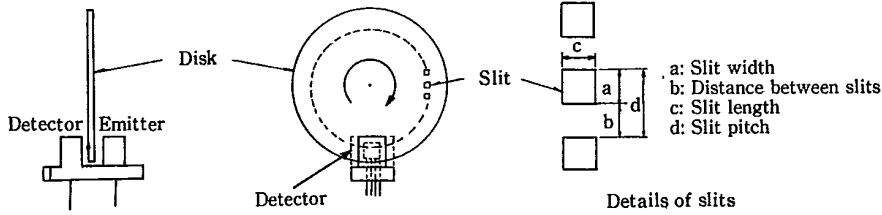
Internal Equivalent Circuit



Operation Diagram

Definition of Rotational Direction

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Drawing seen from emitter  
(Clockwise rotation)

(Precautions for Use)

- The slit shall be designed as follows:  $a, b, c=2\text{mm}, d=4\text{mm}$
- In order to stabilize power supply line, connect a by-pass capacitor of more than  $0.01\mu\text{F}$  between  $V_{CC}$  and GND near the device.

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