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# GP1A30R

## OPIC Photointerrupter with Encoder Function

### ■ Features

1. 2-phase (A, B) digital output
2. Possible to use plastic disk
3. High sensing accuracy  
(Disk slit pitch : 0.7mm)
4. TTL compatible output
5. Compact and light

### ■ Applications

1. Electronic typewriters, printers
2. Numerical control machines

### ■ Absolute Maximum Ratings (Ta= 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	65	mA
	*1Peak forward current	I <sub>FM</sub>	1	A
	Reverse voltage	V <sub>R</sub>	6	V
	Power dissipation	P	100	mW
Output	Supply voltage	V <sub>CC</sub>	7	V
	Low level output current	I <sub>OL</sub>	20	mA
	Power dissipation	P <sub>O</sub>	250	mW
Operating temperature		T <sub>opr</sub>	0 to + 70	°C
Storage temperature		T <sub>stg</sub>	- 40 to + 80	°C
*2Soldering temperature		T <sub>sol</sub>	260	°C

\*1 Pulse width ≤ 100μs, Duty ratio= 0.01

\*2 For 5 seconds

### ■ Electro-optical Characteristics

(Unless otherwise specified, Ta = 0 to + 70°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V <sub>F</sub>	Ta = 25°C, I <sub>F</sub> = 30mA	-	1.2	1.5	V
	Reverse current	I <sub>R</sub>	Ta = 25°C, V <sub>R</sub> = 3V	-	-	10	μA
Output	Operating supply voltage	V <sub>CC</sub>		4.5	5.0	5.5	V
	High level output voltage	V <sub>OH</sub>	*3V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA	2.4	4.9	-	V
	Low level output voltage	V <sub>OL</sub>	*3I <sub>OL</sub> = 8mA, V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA	-	0.1	0.4	V
	Supply current	I <sub>CC</sub>	*3*4I <sub>F</sub> = 30mA, V <sub>CC</sub> = 5V	-	5	20	mA
Transfer characteristics	Duty ratio	*5D <sub>A</sub>	V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA,	20	50	80	%
		*5D <sub>B</sub>	*3f = 2.5kHz	20	50	80	%
	Response frequency	f <sub>MAX.</sub>	*3V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA	-	-	5	kHz

\*3 Measured under the condition shown in Measurement Conditions.

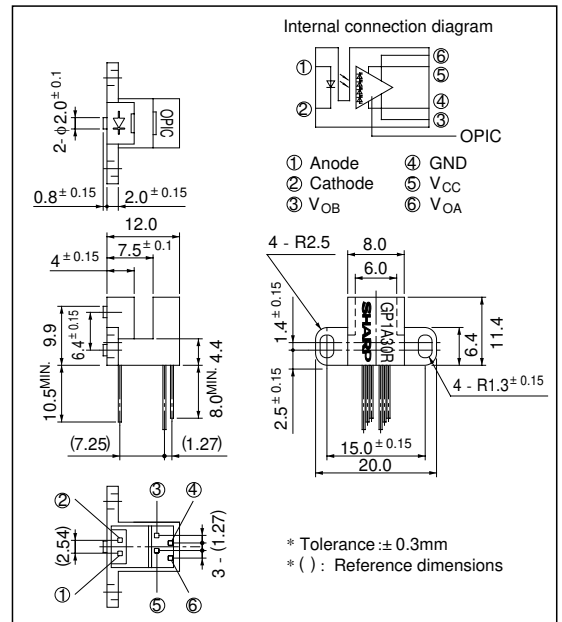
\*4 In the condition that output A and B are low level.

\*5

$$D_A = \frac{t_{AH}}{t_{AP}} \times 100, \quad D_B = \frac{t_{BH}}{t_{BP}} \times 100$$

### ■ Outline Dimensions

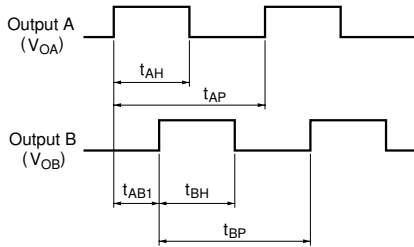
(Unit : mm)



\*\* 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.

■ Output Waveforms



Rotational direction: Counterclockwise when seen from OPIC light detector

Fig. 1 Forward Current vs. Ambient Temperature

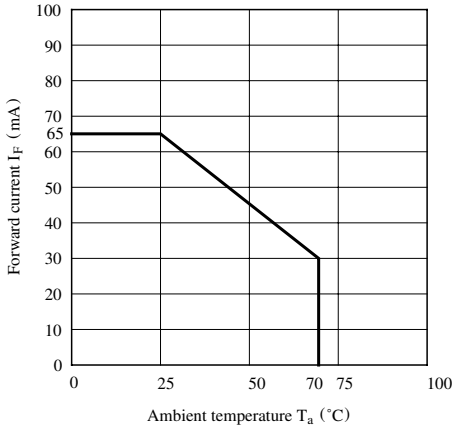


Fig. 2 Output Power Dissipation vs. Ambient Temperature

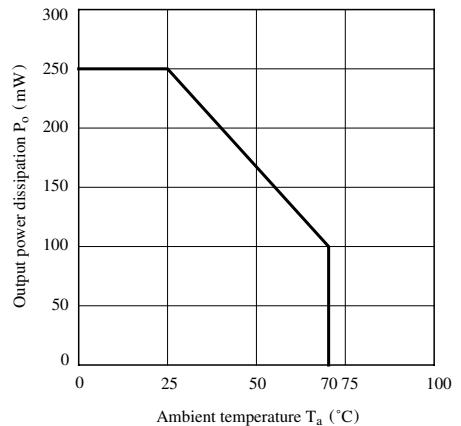


Fig. 3 Duty Ratio vs. Frequency

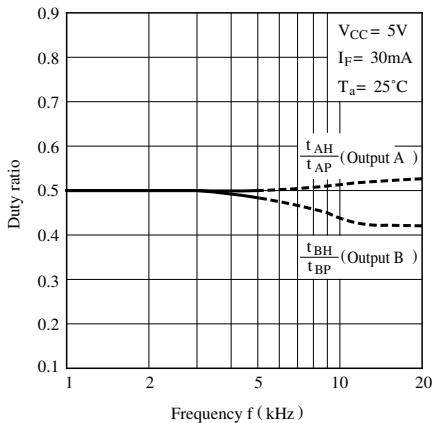
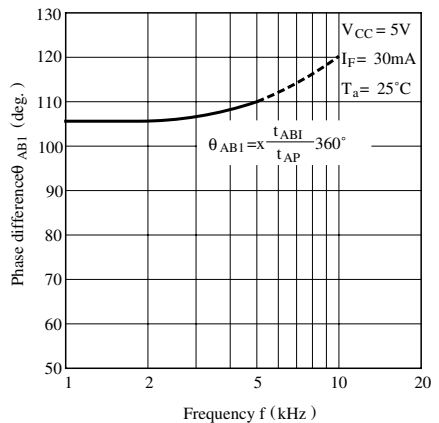
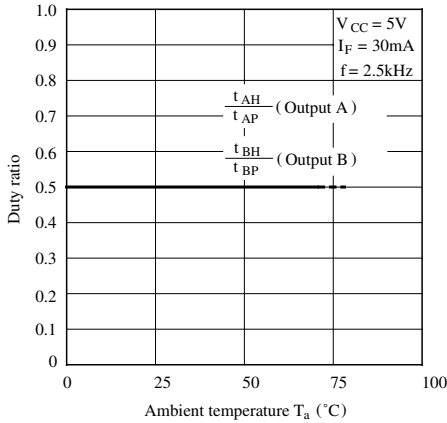


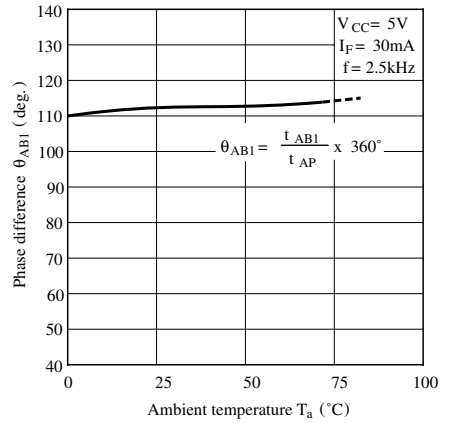
Fig. 4 Phase Difference vs. Frequency



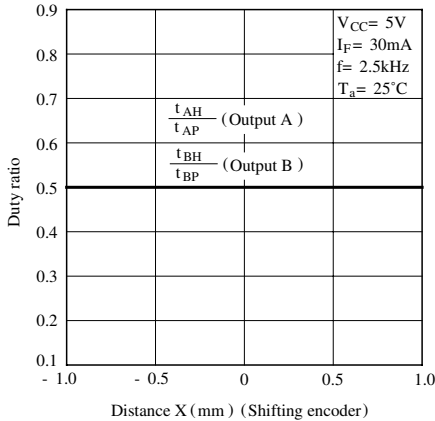
**Fig. 5 Duty Ratio vs. Ambient Temperature**



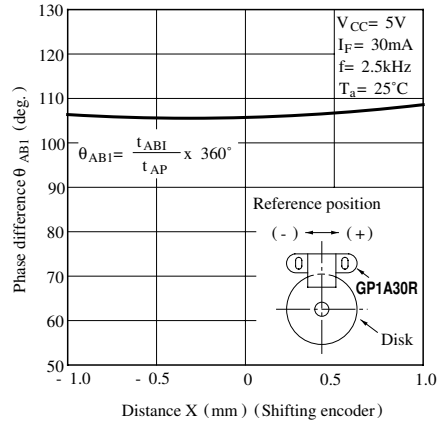
**Fig. 6 Phase Difference vs. Ambient Temperature**



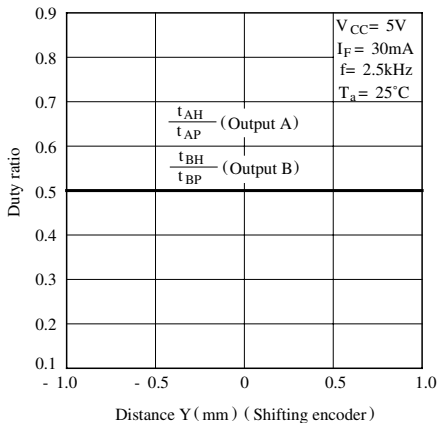
**Fig. 7 Duty Ratio vs. Distance (X direction)**



**Fig. 8 Phase Difference vs. Distance (X direction)**



**Fig. 9 Duty Ratio vs. Distance (Y direction)**



**Fig.10 Phase Difference vs. Distance (Y direction)**

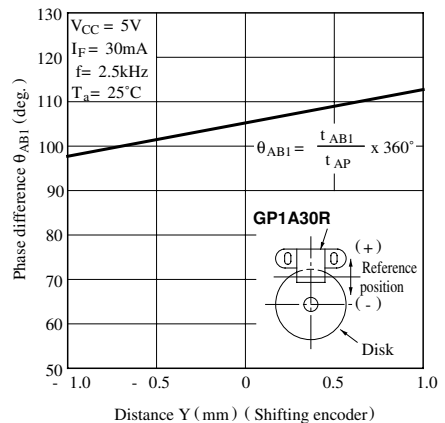


Fig.11 Duty Ratio vs. Distance ( Z direction )

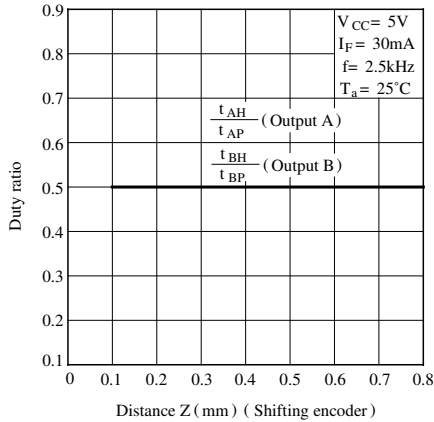
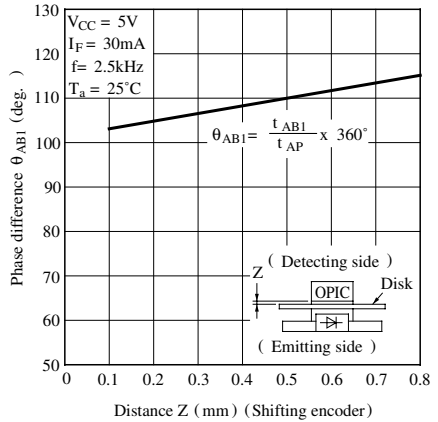
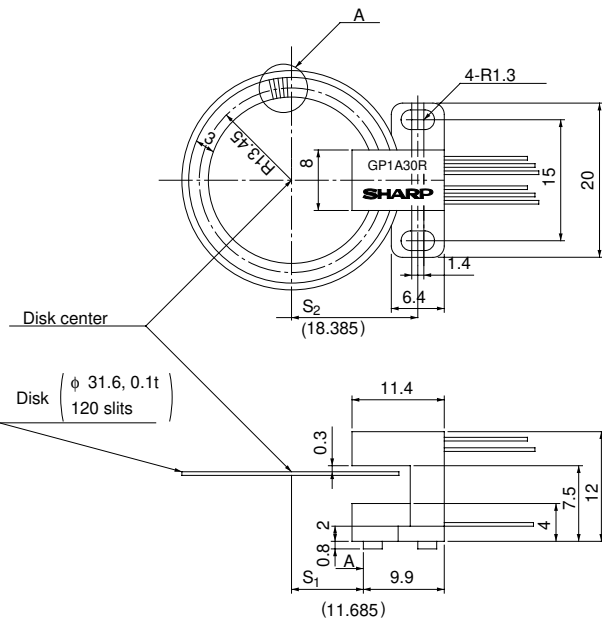


Fig.12 Phase Difference vs. Distance ( Z direction )



■ Measurement Conditions



■ Precautions for Use

- (1) This module is designed to be operated at  $I_F = 30mA$  TYP.
- (2) Fixing torque : MAX. 0.6Nm (6kgf • cm)
- (3) In order to stabilize power supply line, connect a by-pass capacitor of more than  $0.01\mu F$  between  $V_{CC}$  and GND near the device.
- (4) As for other general cautions, refer to the chapter "Precautions for Use".

<Basic Design>

$R_0$  ( distance between the disk center and half point of a slit ),  
 $P$  ( slit pitch ),  $S_1$  and  $S_2$  ( installing position of photointerrupter ) will be provided by the following equations.

Slit pitch :  $P$  ( slit center )

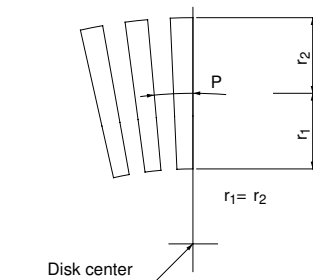
$$R_0 = \frac{N}{120} \times 13.45 \text{ (mm)} \quad N: \text{ number of slits}$$

$$P = \frac{2 \times p \times R_0}{N} \text{ (mm)}$$

$$S_1 = R_0 - 1.765 \text{ (mm)}, S_2 = S_1 + 6.7 \text{ (mm)}$$

Note ) When the number of slits is changed, values in parenthesis are also changed according to the number.

Enlarged drawing of A portion  
 Slit pitch :  $P$



( Ex. ) In the case of  
 $N = 200P/R$

$$R_0 = \frac{200}{120} \times 13.45 \text{ (mm)}$$

$$= 22.42 \text{ mm}$$

$$P = \frac{2 \times p \times 22.42}{200} \text{ (mm)}$$

$$= 0.704 \text{ mm}$$

$$S_1 = 22.42 - 1.765$$

$$= 20.655 \text{ mm}$$

$$S_2 = 20.655 + 6.7$$

$$= 27.355 \text{ mm}$$

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