

# GP1A33R

## OPIC Photointerrupter with Encoder Function

### ■ Features

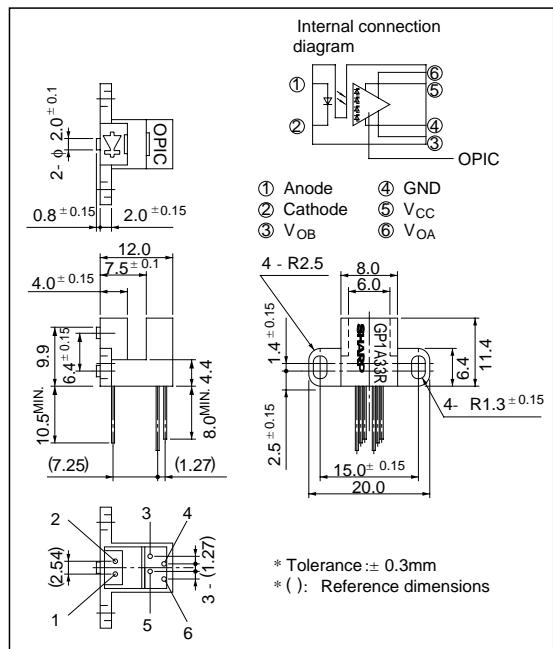
1. 2-phase (A, B) digital output
2. Capable of using plastic disk
3. Sensing accuracy  
(Disk slit pitch: 1.14mm)
4. TTL compatible
5. Compact and light

### ■ Applications

1. Electronic typewriters, printers
2. Numerical control machines

### ■ 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

(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>sot</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)

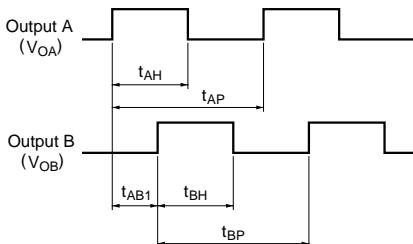
| Parameter                |                           | Symbol                        | Conditions  | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------------|-------------------------------|---|------|------|------|------|
| Input                    | Forward voltage           | 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>               | * <sup>3</sup> V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA                        | 2.4  | 4.9  | -    | V    |
|                          | Low level output voltage  | V <sub>OL</sub>               | * <sup>3</sup> I <sub>OL</sub> = 8mA, V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA | -    | 0.1  | 0.4  | V    |
| Transfer characteristics | Supply current            | I <sub>CC</sub>               | * <sup>3</sup> * <sup>4</sup> I <sub>F</sub> = 30mA, V <sub>CC</sub> = 5V         | -    | 5    | 20   | mA   |
|                          | Duty ratio                | D <sub>A</sub> * <sup>5</sup> | V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA,                                      | 20   | 50   | 80   | %    |
|                          |                           | D <sub>B</sub> * <sup>5</sup> | * <sup>3</sup> f = 2.5kHz   | 20   | 50   | 80   | %    |
|                          | Response frequency        | f <sub>MAX.</sub>             | * <sup>3</sup> V <sub>CC</sub> = 5V, I <sub>F</sub> = 30mA                        | -    | -    | 5    | kHz  |

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

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

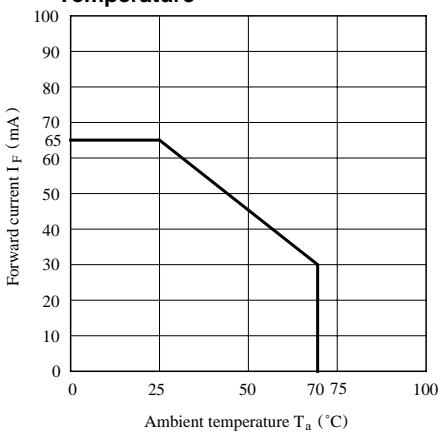
\*5 D<sub>A</sub> =  $\frac{t_{AH}}{t_{AP}} \times 100$ , D<sub>B</sub> =  $\frac{t_{BH}}{t_{BP}} \times 100$

## ■ Output Waveforms

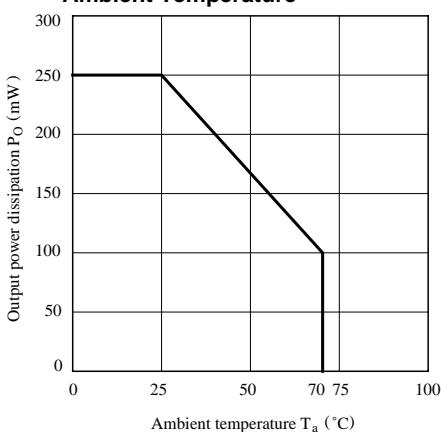


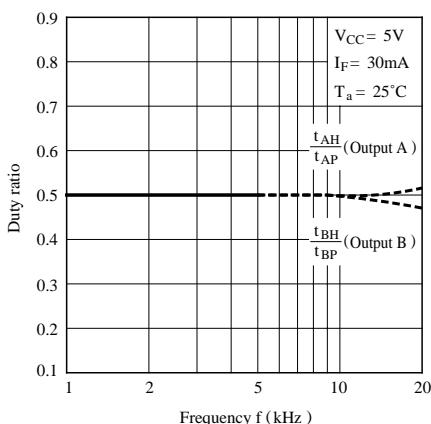
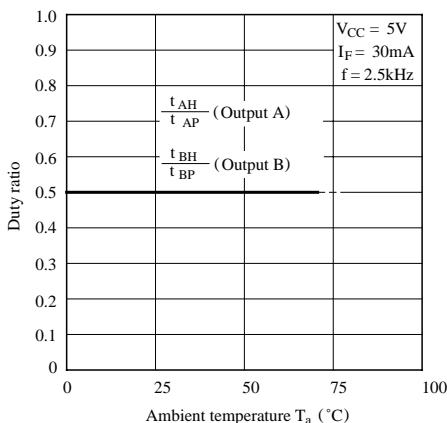
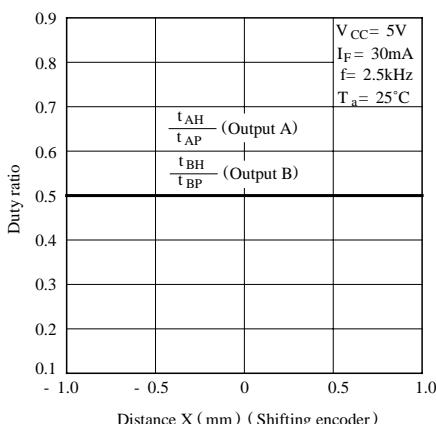
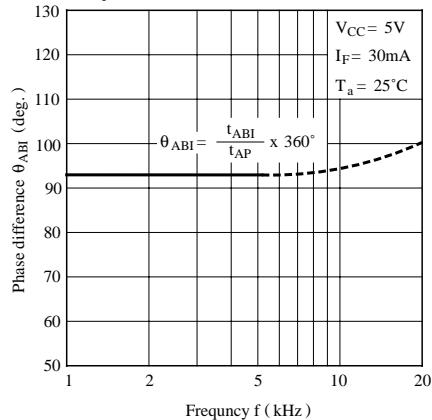
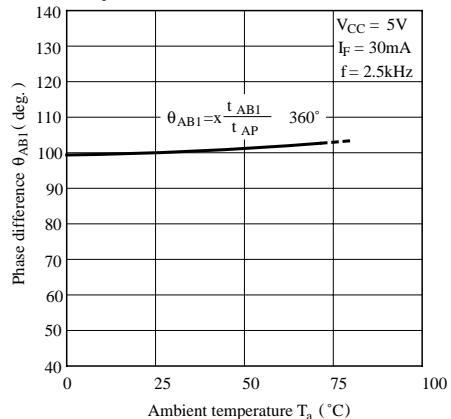
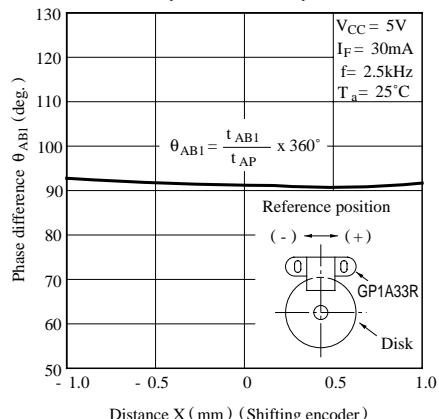
Rotational direction : Counterclockwise when seen from OPIC light detector

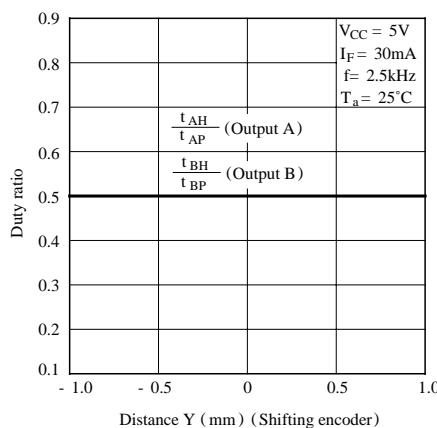
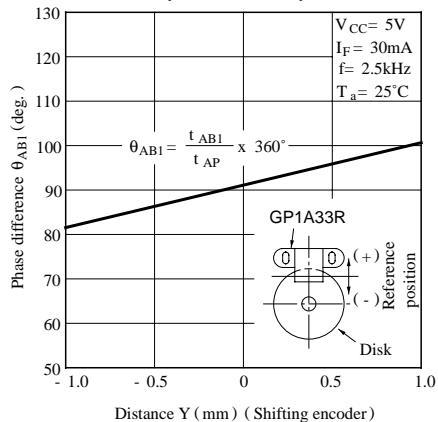
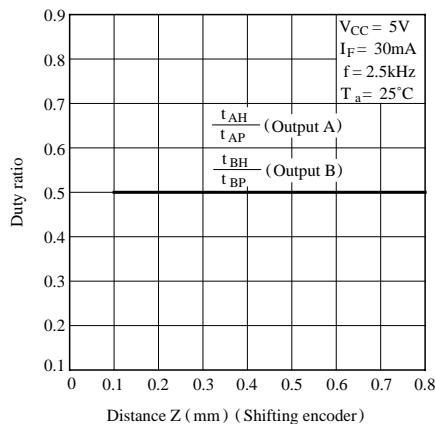
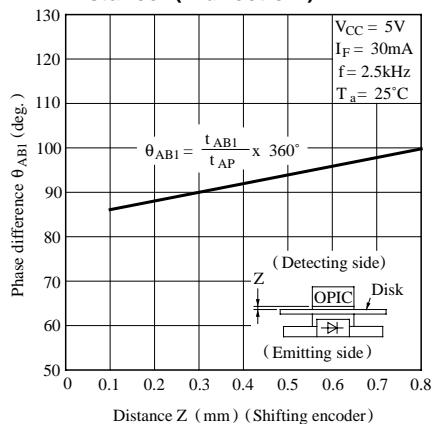
**Fig. 1 Forward Current vs. Ambient Temperature**



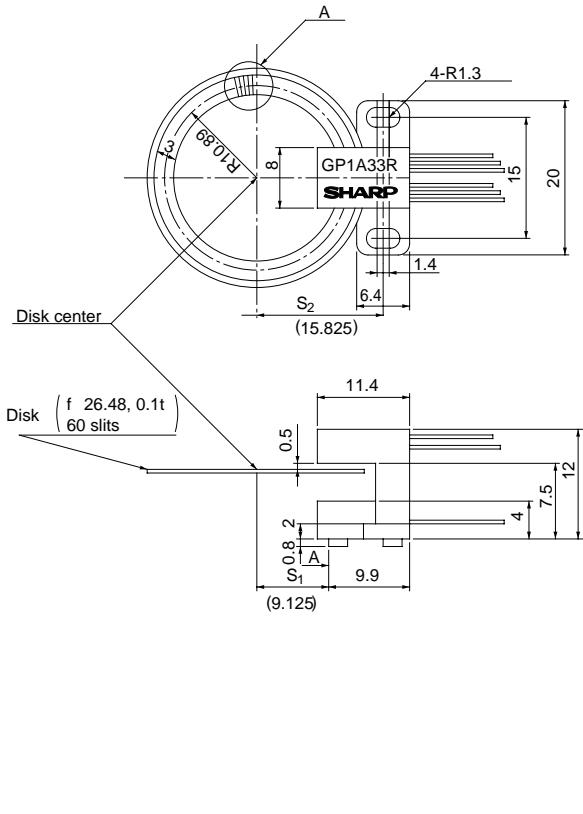
**Fig. 2 Output Power Dissipation vs. Ambient Temperature**



**Fig. 3 Duty Ratio vs. Frequency****Fig. 5 Duty Ratio vs. Ambient Temperature****Fig. 7 Duty Ratio vs. Distance (X direction)****Fig. 4 Phase Difference vs. Frequency Temperature****Fig. 6 Phase Difference vs. Ambient Temperature****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



## <Basic Design>

$R_O$  (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)

$$R_O = \frac{N}{60} \times 10.89 \text{ (mm)} \quad N: \text{ number of slits}$$

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

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

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

## Enlarged drawing of A portion

(Ex.) In the case of  
 $N = 100P/R$

$$R_O = \frac{100}{60} \times 10.89 \text{ (mm)}$$

$$= 18.15 \text{ mm}$$

$$P = \frac{2 \times p \times 18.15}{100}$$

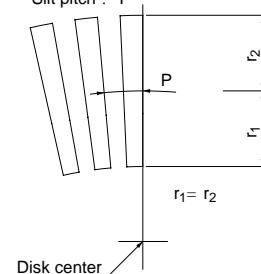
$$= 1.14 \text{ mm}$$

$$S_1 = 18.15 - 1.765$$

$$= 16.385 \text{ mm}$$

$$S_2 = 16.385 + 6.7$$

$$= 23.085 \text{ mm}$$



## ■ Precautions for Use

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