# GP1A33R

## OPIC Photointerruper with Encoder Function

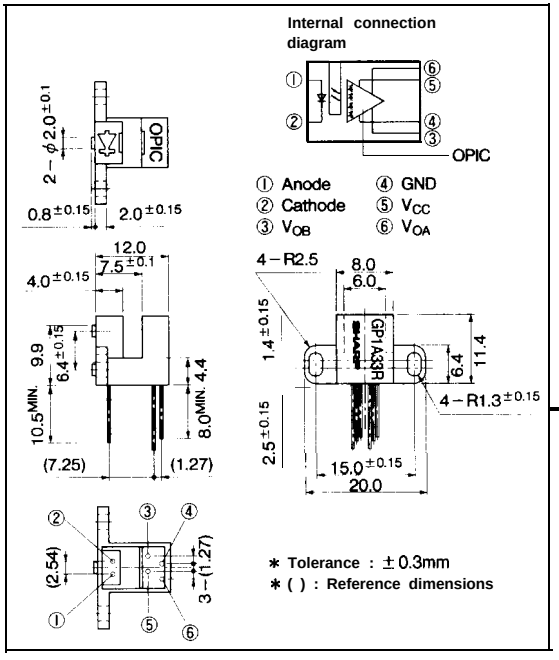
### ■ Features

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. Robots
3. 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 | $I_F$ | 65 | mA |
| | *1 Peak forward current | $I_{FM}$ | 1 | A |
| | Reverse Voltage | $V_R$ | 6 | V |
| | Power dissipation | P | 100 | mW |
| Output | Supply voltage | $V_{CC}$ | 7 | V |
| | Low level output current | $I_{OL}$ | 20 | mA |
| | Power dissipation | $P_O$ | 250 | mW |
| Operating temperature | | $T_{opr}$ | 0 to +70 | °C |
| Storage temperature | | $T_{stg}$ | −40 to +80 | °C |
| *2 Soldering temperature | | $T_{sol}$ | 260 | °C |

*1 Pulse width ≦ 100 μs, Duty ratio = 0.01
*2 For 5 seconds

## ■ Electro-optical Characteristics

(Unless otherwise specified, Ta=O to +70℃)

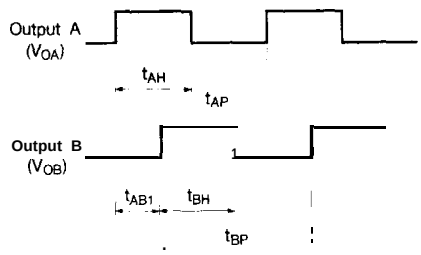
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Input | Forward voltage | $V_F$ | Ta=25℃, $I_F$=30mA | − | 1.2 | 1.5 | V |
| | Reverse current | $I_R$ | Ta=25℃, $V_R$=3V | − | | 10 | μA |
| Output | Operating supply voltage | $V_{CC}$ | | 4.5 | 5.0 | 5.5 | V |
| | High level output voltage | $V_{OH}$ | *3 $V_{CC}$ = 5V, $I_F$=30mA | 2.4 | 4.9 | − | V |
| | Low level output voltage | $V_{OL}$ | *3 $I_{OL}$=8mA, $V_{CC}$=5V, $I_F$=30mA | − | 0.1 | 0.4 | V |
| | Supply current | $I_{CC}$ | *3*4 $I_F$=30mA, $V_{CC}$=5V | − | 5 | 20 | mA |
| Transfer characteristics | Duty ratio | $D_A$*5 | $V_{CC}$=5V, $I_F$=30mA, *3 f=2.5kHz | 20 | 50 | 80 | % |
| | | $D_B$*5 | | 20 | 50 | 80 | % |
| | Response frequency | $f_{MAX}$ | *3 $V_{CC}$ = 5V, $I_F$=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 $D_A=\frac{t_{AH}}{t_{AP}}\times 100$, $D_B=\frac{t_{BH}}{t_{BP}}\times 100$

## ■ Output Waveforms




Rotational direction : Counterclockwise when seen from OPIC light detector

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

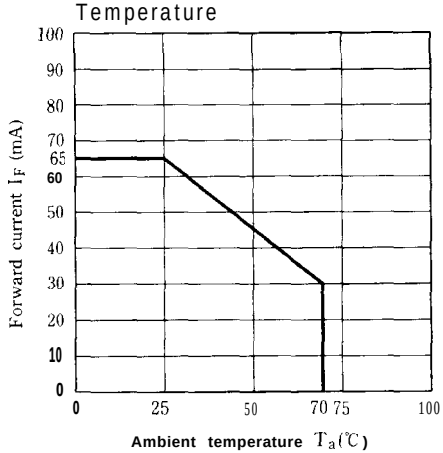



**Fig. 2 output Power Dissipation vs. Ambient Temperature**

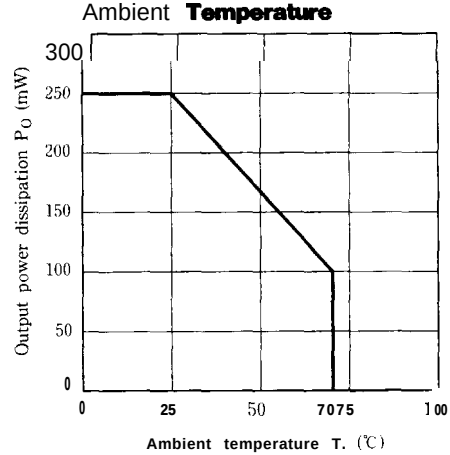


**Fig. 3 Duty Ratio vs. Frequency**

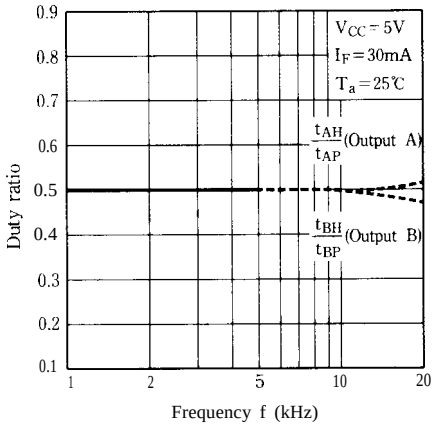



**Fig. 4 Phase Difference vs. Frequency Temperature**

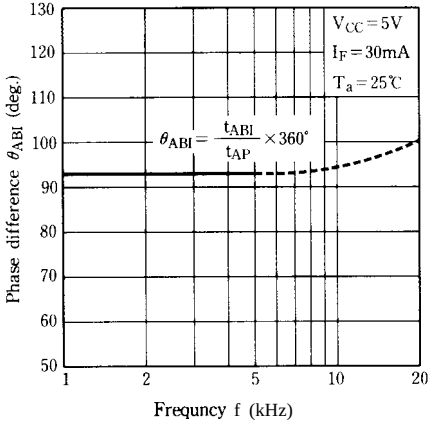



**Fig. 5 Duty Ratio vs. Ambient Temperature**

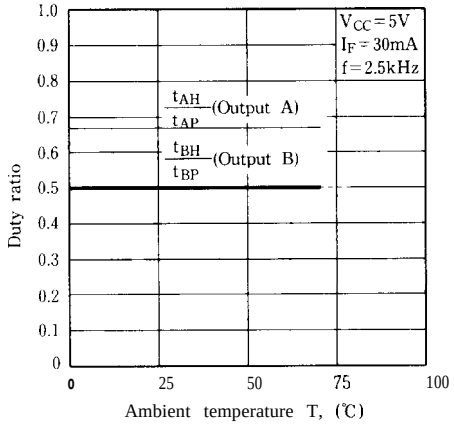



**Fig. 6 Phase Difference vs. Ambient Temperature**

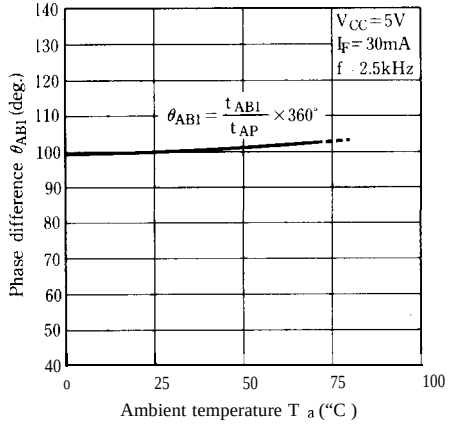



**Fig. 7 Duty Ratio vs. Distance (X direction)**

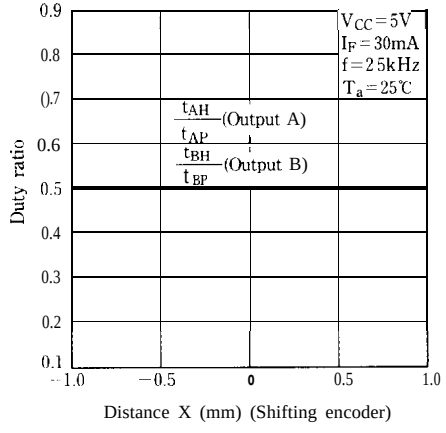



**Fig. 8 Phase Difference vs. Distance (X direction)**

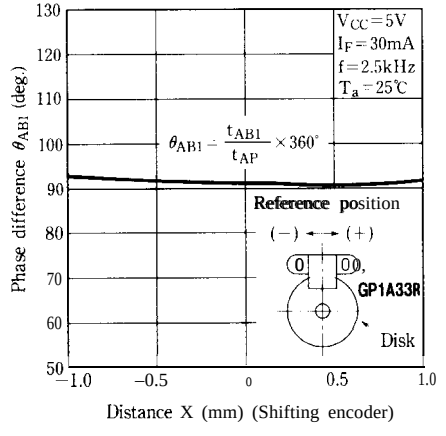


**Fig. 9 Duty Ratio vs. Distance (Y direction)**

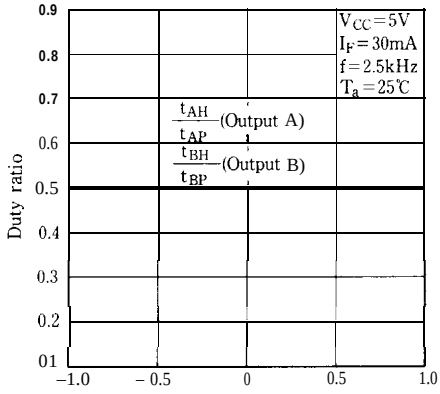



**Fig.10 Phase Difference vs. Distance (Y direction)**

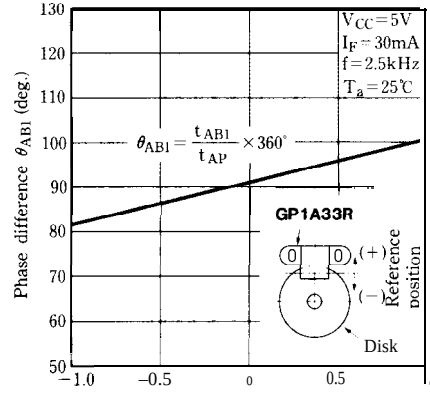



**Fig.11 Duty Ratio vs. Distance (Z direction)**

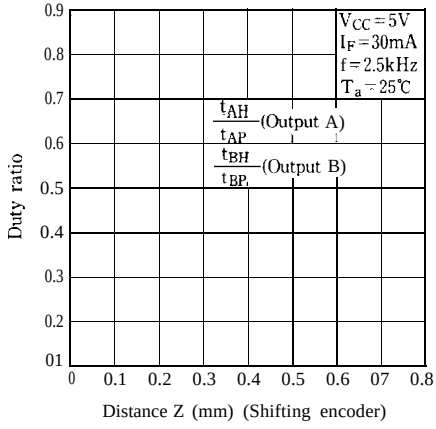
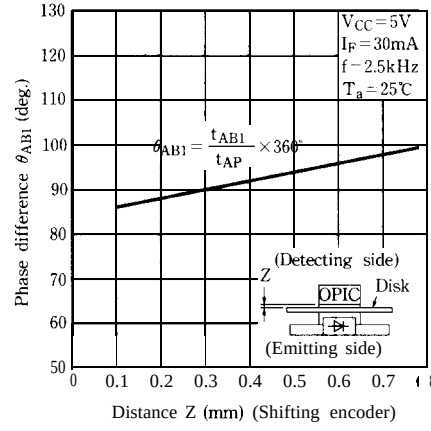
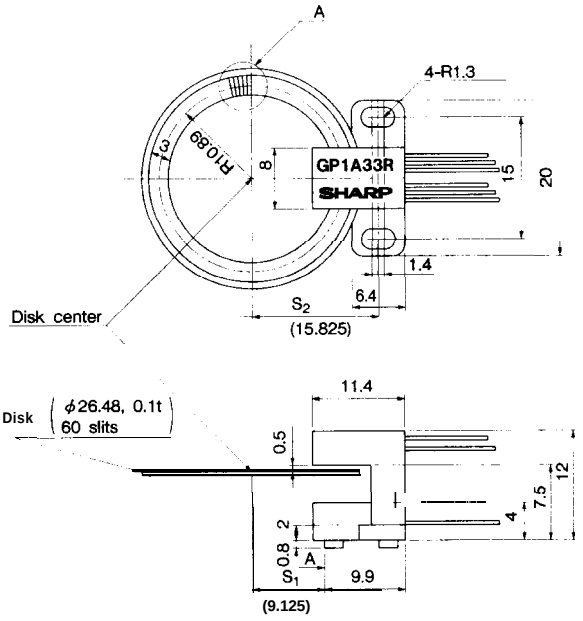



**Fig.12 Phase Difference vs. Distance (Z direction)**



**Measurement Conditions**




**〈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)

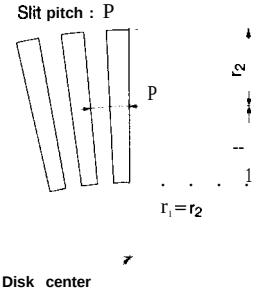
$$R_O = \frac{N}{60} \times 0.89 \text{ (mm)} \qquad N : \text{number of slits}$$

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

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

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

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

$= 18.15\text{mm}$

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

$= 1.14\text{mm}$

$S_1 = 18.15 - 1.765$

$= 16.385\text{mm}$

$S_2 = 16.385 + 6.7$

$= 23.085\text{mm}$

## ■ Precautions for Use

(1) This module is designed to be operated at $I_F = 30\text{mA}$ TYP.
(2) Fixing torque : MAX. 6kg · cm
(3) In order to stabilize power supply line, connect a by-pass capacitor of more than 0.01 μF between Vcc and GND near the device.
(4) As for other general cautions, refer to the chapter "Precautions for Use" (Page 78 to 93)