# GP1A16R OPIC Photointerrupter with Encoder Function

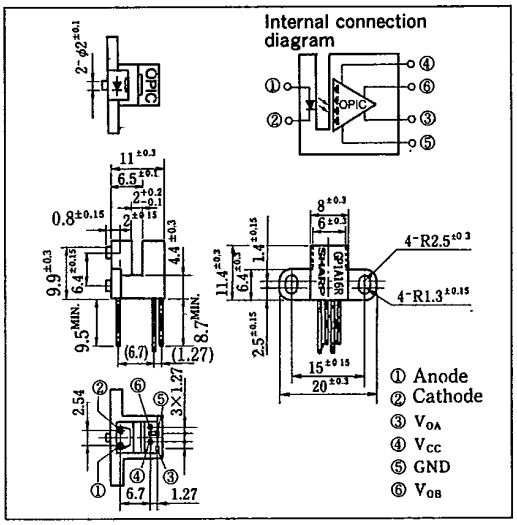
## ■ Features

1. 2-phase (A, B) digital output
2. High sensing accuracy (Disk slit pitch: 0.7mm)
3. TTL compatible output
4. Compact

## ■ Applications

1. Electronic typewriters, printers
2. Robots
3. Numerical control machines

## ■ 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 (Ta=25°C)

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input | Forward current | $I_F$ | 50 | mA |
| | *1Peak forward current | $I_{FM}$ | 1 | A |
| | Reverse voltage | $V_R$ | 6 | V |
| | Power dissipation | P | 75 | 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~+70 | °C |
| Storage temperature | | $T_{stg}$ | −40~+80 | °C |
| *2Soldering temperature | | $T_{sol}$ | 260 | °C |

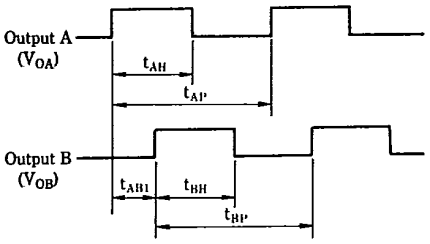
*1 Pulse width≦100μs, Duty ratio=0.01
*2 For 5 seconds

## ■ Electro-optical Characteristics (Unless otherwise specified, Ta=0~+70°C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Input | Forward voltage | $V_F$ | Ta=25°C, $I_F$=20mA | — | 1.2 | 1.4 | V |
| | Reverse current | $I_R$ | Ta=25°C, $V_R$=3V | — | — | 10 | μA |
| Output | Operating supply voltage | $V_{CC}$ | | 4.5 | 5.0 | 5.5 | V |
| | High level output voltage | $V_{OH}$ | $V_{CC}$=5V, $I_F$=20mA*3 | 2.4 | 4.9 | — | V |
| | Low level output voltage | $V_{OL}$ | $I_{OL}$=8mA, $V_{CC}$=5V, $I_F$=20mA*3 | — | 0.1 | 0.4 | V |
| | Supply current | $I_{CC}$ | $I_F$=20mA, $V_{CC}$=5V*4 | — | 5 | 20 | mA |
| Transfer characteristics | Duty ratio | $D_A$*5 | $V_{CC}$=5V, $I_F$=20mA*3 f=2.5kHz | 0.20 | 0.50 | 0.80 | — |
| | | $D_B$*5 | | 0.20 | 0.50 | 0.80 | |
| | Response frequency | $f_{MAX.}$ | $V_{CC}$=5V, $I_F$=20mA*3 | — | — | 10 | kHz |

*3 Measured under the condition shown in Measurement Conditions
*4 In the condition that outputs A and B are low level.
*5 $D_A=\frac{t_{AH}}{t_{AP}}$, $D_B=\frac{t_{BH}}{t_{BP}}$

## ■ Output Waveforms




Rotational direction: Counterclockwise when seen from OPIC light detector

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

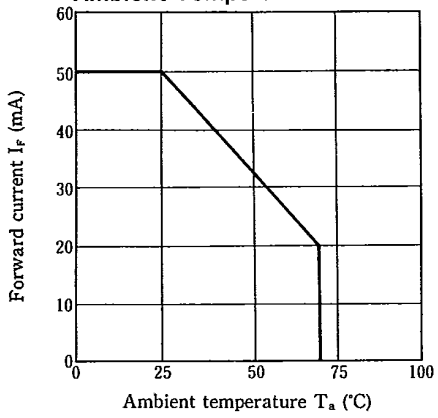



**Fig. 2 Output Power Dissipation vs. Ambient Temperature**

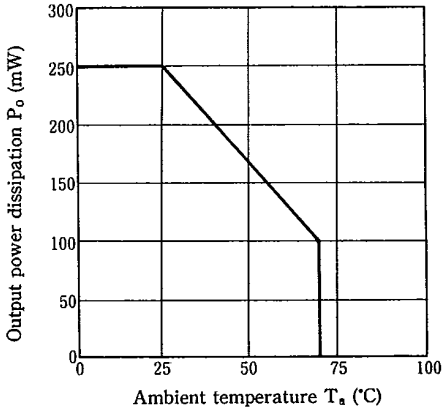



**Fig. 3 Duty Ratio vs. Frequency**

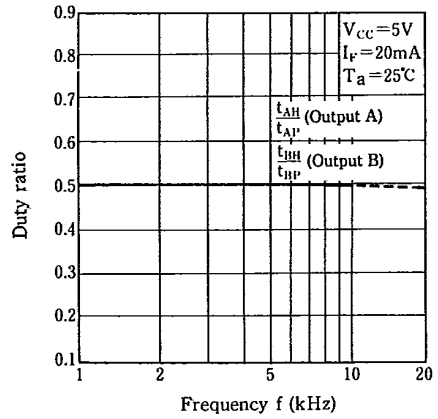



**Fig. 4 Phase Difference vs. Frequency**

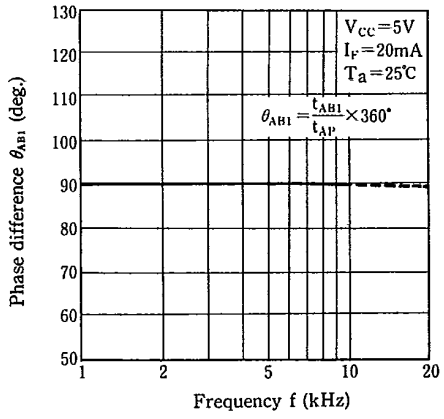


**Fig. 5 Duty Ratio vs. Ambient Temperature**

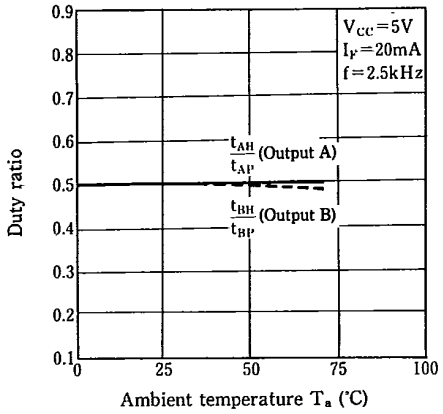



**Fig. 6 Phase Difference vs. Ambient Temperature**

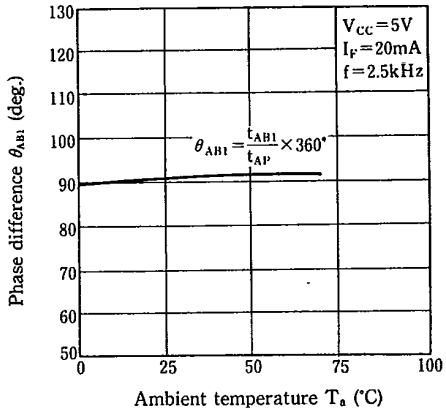



**Fig. 7 Duty Ratio vs. Distance (X direction)**

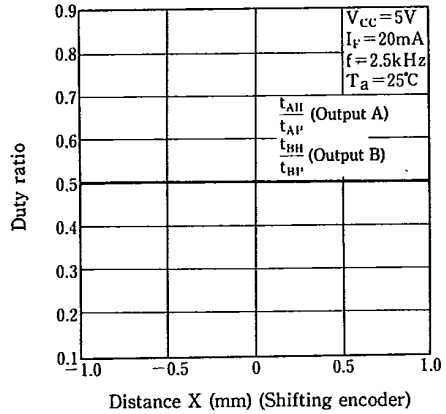



**Fig. 8 Phase Difference vs. Distance (X direction)**

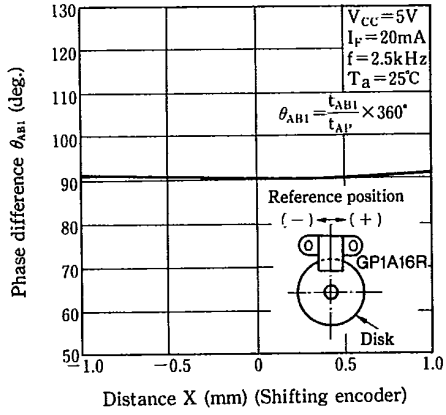



**Fig. 9 Duty Ratio vs. Distance (Y direction)**

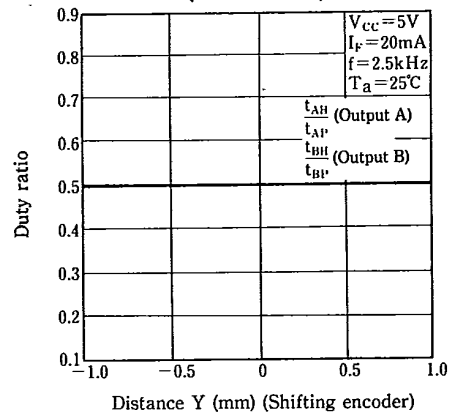
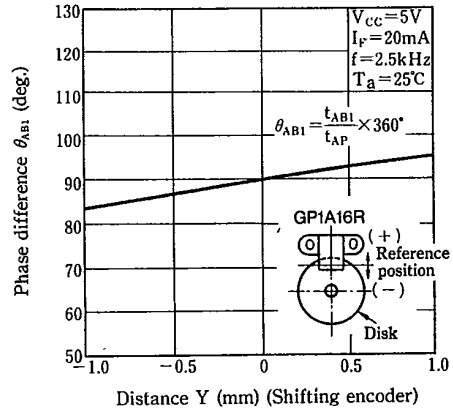



**Fig. 10 Phase Difference vs. Distance (Y direction)**




7

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

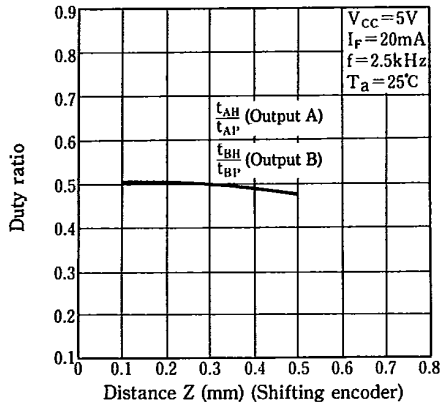
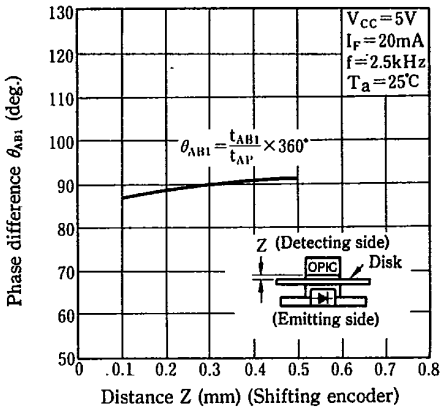
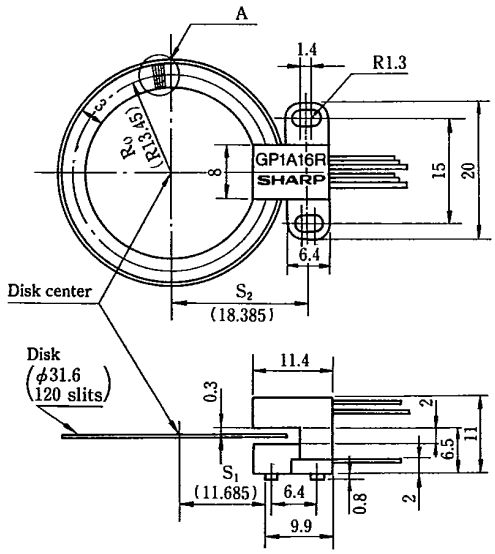



**Fig. 12 Phase Difference vs. Distance (Z direction)**




## ■ Measurement Conditions




<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)

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

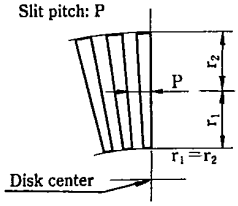
$P = \frac{2\pi R_0}{N}$

$S_1 = R_0 - 1.765$ (mm) $S_2 = S_1 + 6.7$ (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 200P/R

$R_0 = \frac{200}{120} \times 13.45$

$= 22.42$mm

$P = \frac{2 \times \pi \times 22.42}{200}$

$= 0.704$mm

$S_1 = 22.42 - 1.765$

$= 20.655$mm

$S_2 = 20.655 + 6.7$

$= 27.355$mm

## ■ Disk is optional.

Following types are available.

| Model No. | Resolution (P/R) |
|---|---|
| GP1P16RA | 120 |
| GP1P16RB | 200 |

**(Precautions for Use)**

Note 1) In order to stabilize power supply line, connect a by-pass capacitor of more than 0.01μF between $V_{CC}$ and GND near the device.

Note 2) This module is designed to be operated at $I_F$= 20mA TYP.