IS1U60/IS1U60L

Sensors with 1-Package Design of Remote Control Detecting Functions owing to OPIC

■ Features

1. 1-package design owing to adoption of OPIC
2. Compact
    (Volume : About 1/8 compared with **GP1U58X**)
3. B.P.F. (Band Pass Frequency) : (TYP. 38kHz)
4. Aspherical lens

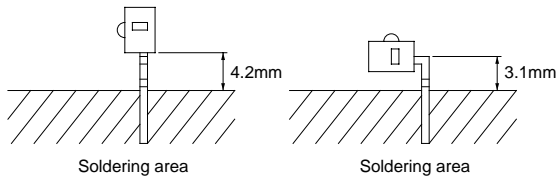## ■ Applications

1. Audio equipment
2. Cameras

■ Absolute Maximum Ratings   (Ta=25˚C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	0 to 6.0	V
*1 Operating temperature	T_{opr}	- 10 to + 60	˚C
Storage temperature	T_{stg}	- 20 to + 70	˚C
*2 Soldering temperature	T_{sol}	260	˚C

*1 No dew condensation is allowed.

*2 For 5 seconds

Soldering area   Soldering area

4.2mm   3.1mm

■ Outline Dimensions   (Unit : mm)

IS1U60

① V_{OUT}
② GND
③ V_{CC}

* Tolerance : ± 0.2

IS1U60L

① V_{OUT}
② GND
③ V_{CC}

* Tolerance : ± 0.2
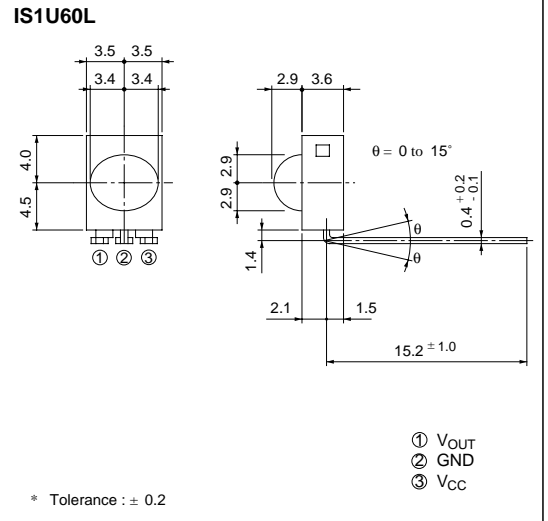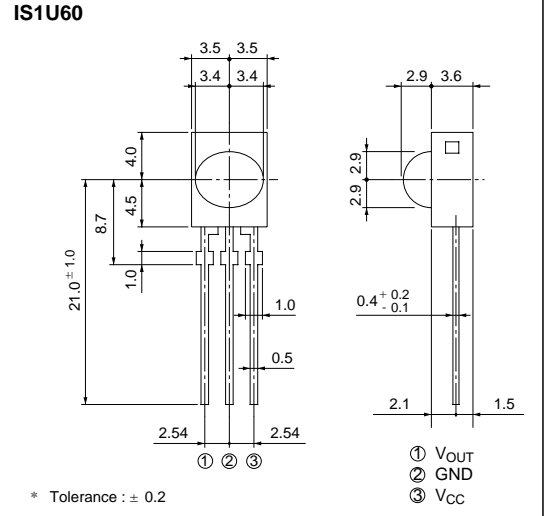
* "OPIC" (Optical IC) is a trademark of the SHARP Corporation.
  An OPIC consists of a light-detecting element and signal-processing circuit
  integrated onto a single chip.

■ Recommended Operating Conditions

Parameter	Symbol	Recommended operating conditions	Unit
Operating supply voltage	V_{CC}	4.7 to 5.3	V

■ Electrical Characteristics

(Ta=25°C, V_{CC} =+5V)

| Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Dissipation current	I_{CC}	No input light	-	2.8	4.5	mA
High level output voltage	V_{OH}	*3, Output terminal OPEN	V_{CC}- 0.2	-	-	V
Low level output voltage	V_{OL}	*3, *4	-	0.45	0.6	V
High level pulse width	T_1	*3	400	-	800	μs
Low level pulse width	T_2		400	-	800	μs
B.P.F. center frequency	f_O		-	38	-	kHz
Linear ultimate distance	L	ϕ, θ = 0°, E_e < 10 lx	5.0	-	-	m
Linear ultimate distance	L_1	ϕ = ± 30° (θ = 0°) θ = ± 15° (ϕ = 0°) E_e < 10 lx	3.0	-	-	m

*3 The burst wave as shown in the following figure shall be transmitted.
*4 Pull-up resistance : 2.2kΩ
*5 By SHARP transmitter

fo= 38kHz, Duty 50%
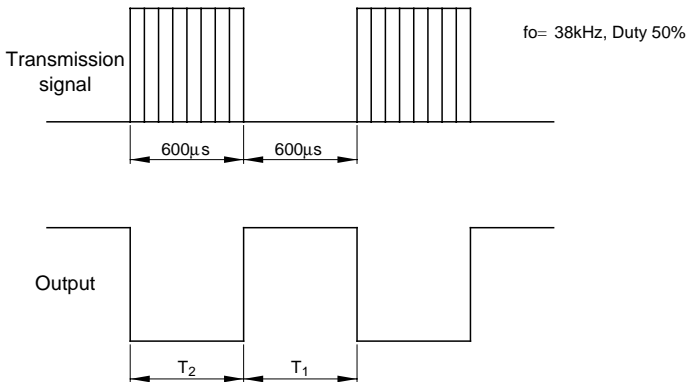
■ Internal Block Diagram
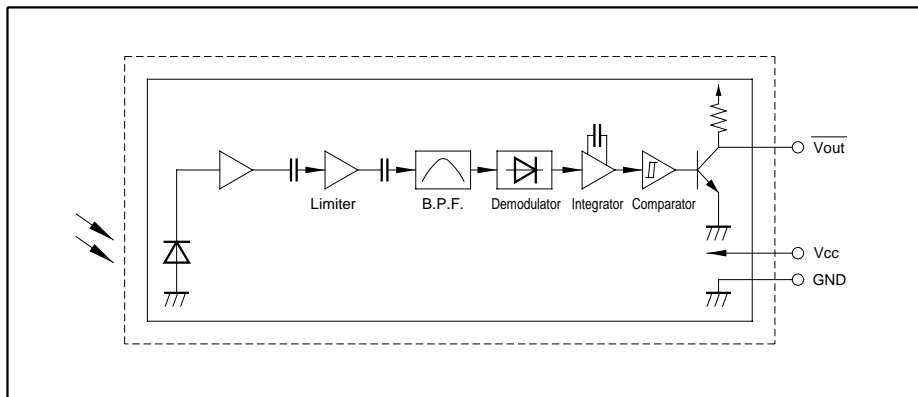
■ Performance

Using the transmitter shown in Fig. 1, the output signal of the light detecting unit is good enough to meet the following items in the standard optical system in Fig. 2.

(1) Linear reception distance characteristics

When L=0.2 to 5 m, Ee < 10 lx (*4) and ϕ =0˚ in Fig. 2, the output signal shall meet the electrical characteristics in the attached list.

(2) Sensitivity angle reception distance characteristics

When L=0.2 to 3 m, Ee < 10 lx (*4) and ϕ<= 30 ˚ in the direction X and θ =0˚ in the direction Y in Fig. 2,

the output signal shall meet the electrical characteristics in the attached list   Further, the electrical characteristics shall be met

when L=0.2 to 5 m, Ee < 10 lx (*4) and ϕ =0˚ in the direction X and θ<= 15˚ in the direction Y.
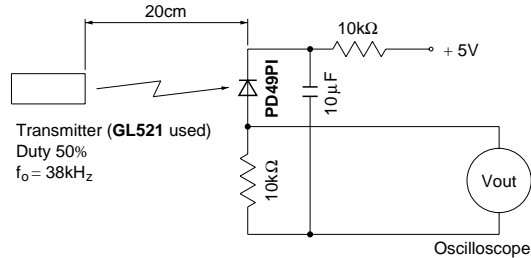
*4 It refers to detector face illuminance.

Fig. 1 Transmitter

In the above figure, the transmitter should be set so that the output Vout can be 40mV$_{P-P}$.

However, the **PD49PI** to be used here should be of the short-circuit current I$_{SC}$=2.6μ A at Ev=100 lx.

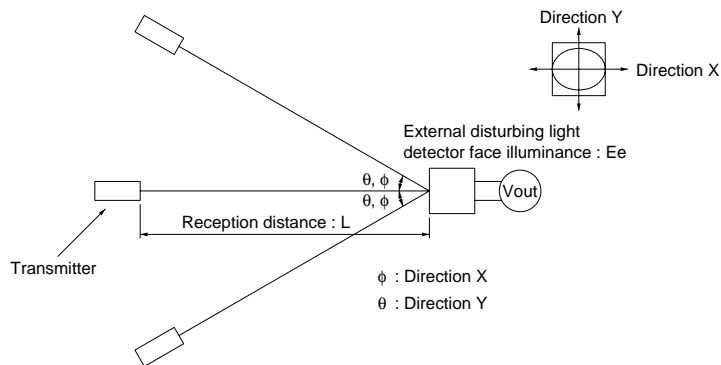(Ev is an illuminance by CIE standard light source A (tungsten lamp).)

Fig. 2 Standard optical system
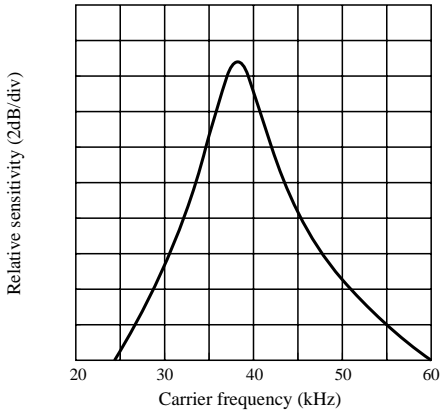
Fig. 1 B.P.F. Frequency Characteristics (TYP.)

Relative sensitivity (2dB/div)

Carrier frequency (kHz)

20   30   40   50   60

Fig. 2 Sensitivity Angle (Direction X)
Characteristics (TYP.) for Reference

- 20°   - 10°   0°   10°   20°

- 30°   30°
- 40°   40°
- 50°   50°
- 60°   60°
- 70°   70°
- 80°   80°
- 90°   90°

Relative reception distance (%)

0

Angular displacement φ
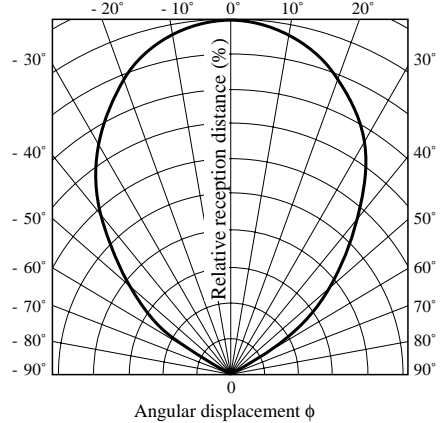
Fig. 3 Sensitivity Angle (Direction Y)
Characteristics (TYP.) for Reference

- 20°   - 10°   0°   10°   20°

- 30°   30°
- 40°   40°
- 50°   50°
- 60°   60°
- 70°   70°
- 80°   80°
- 90°   90°

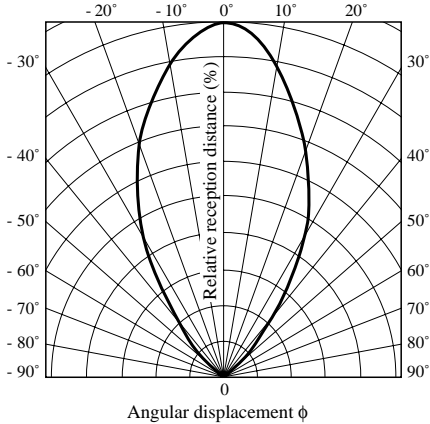Relative reception distance (%)

0

Angular displacement φ

Fig. 4 Relative Reception Distance vs. Ambient
Temperature (TYP.) for Reference

120

100

80

60

40

20

0

Relative reception distance (%)

- 40   - 20   0   20   40   60   80   100

Ambient temperature Ta (°C)

Unit   SHARP
                standard transmitter

Relative comparison with reception
distance at V_{CC}=5V, φ =0° , Ee <10 lx
and Ta=25 °C taken as 100%

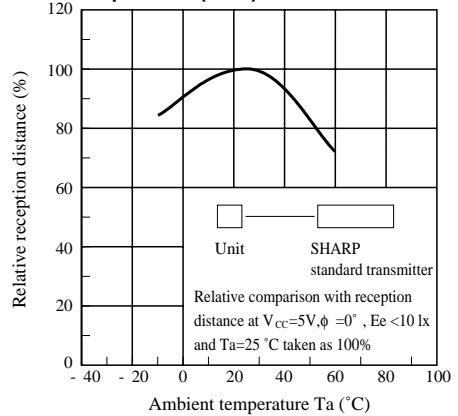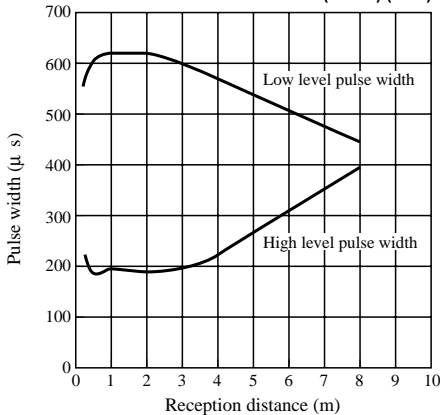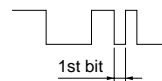**Fig. 5 AEHA (Japan Association of Electrical Home Appliances)**
Code Pulse Width Characteristics (1st Bit) (TYP.) for Reference

700

600

500

400

300

200

100

0

Pulse width (μ s)

0   1   2   3   4   5   6   7   8   9   10

Reception distance (m)

Low level pulse width

High level pulse width

(Conditions)

Unit   AEHA code generating transmitter

V_{CC}=5V, Ta=RT, φ =0° , Ee < 10 lx

1st bit

T= 430 μ s

Fig. 6 Spectral Sensitivity for Reference

Ta=25˚C

Relative sensitivity (%) vs Wavelength λ (nm)

(Graph showing relative sensitivity (%) on the y-axis from 0 to 100, and Wavelength λ (nm) on the x-axis from 500 to 1100)
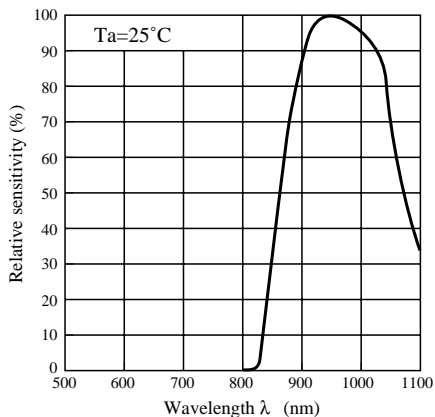
■ Precautions for Operation

(1) Use the light emitting unit (remote control transmitter), in consideration of performance, characteristics, operating conditions of
    light emitting device and the characteristics of the light detecting unit.

(2) Pay attention to a malfunction of the light detecting unit when the surface is stained with dust and refuse.
    Care must be taken not to touch the light detector surface.
        • Conduct cleaning as follows.

(3) Cleaning
        Solvent dip cleaning : Solvent temperature of 45 ˚C max., dipping time : Within 3 minutes
        Ultrasonic cleaning   : Elements are affected differently depending on the size of cleaning bath, ultrasonic output, time,
                                size of PWB and mounting method of elements.
                                Conduct trial cleaning on actual operating conditions in advance to make sure that no problem results.
        • Use the following solvents only.
            Solvents : Ethyl alcohol, methyl alcohol or isopropyl alcohol

(4) To avoid the electrostatic breakdown of IC, handle the unit under the condition of grounding with human body, soldering iron, etc.

(5) Do not apply unnecessary force to the terminal.

(6) Example of recommended external circuit (mount outer mounting parts near the sensor as much as possible.)

(Circuit diagram showing IS1U60 with terminals V_{CC}, GND, Vout connected through R_1, C_1 to Ve, GND, Vout)
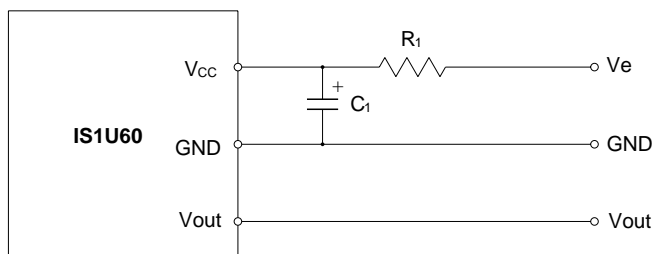
(Circuit constant)
$R_1 = 47\Omega \pm 5\%$
$C_1 = 47\mu F$

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— Industrial control
— Audio visual equipment
— Consumer electronics

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— Traffic signals
— Gas leakage sensor breakers
— Alarm equipment
— Various safety devices, etc.

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