

**TARGET SPECIFICATION**

Product name : PROXIMITY / AMBIENT LIGHT SENSOR

Model No. : GP2AP002A00F

(Codename : Y2607)

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2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.

(Precautions)

- (1) This product is designed for use in the following application areas ;

( · OA equipment · Audio visual equipment · Home appliances )  
( · Telecommunication equipment (Terminal) · Measuring equipment )  
( · Tooling machines · Computers )

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

- (2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;

( · Transportation control and safety equipment (aircraft, train, automobile etc.) )  
( · Traffic signals · Gas leakage sensor breakers · Rescue and security equipment )  
( · Other safety equipment )

- (3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

( · Space equipment · Telecommunication equipment (for trunk lines) )  
( · Nuclear power control equipment · Medical equipment )

- (4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

# REFERENCE

2/11  
GP2AP002A00F  
Aug. 8, 2008 rev. 1.0

1. Application  
This specification applies to the outline and characteristics of transmissive type proximity sensor; Model No. GP2AP002A00F.
2. Outline Refer to the attached drawing No. CY14466i02, page 4.
3. Ratings and characteristics Refer to the attached sheet, Page 5 to 9.
4. Reliability T.B.D.
5. Outgoing inspection T.B.D.

6. Supplement

- 1) This product is built-in photodiode.
- 2) This device confirm eye safety IEC60825-1 class 1.
- 3) Brominated flame retardants  
Specific brominated flame retardants such as the PBB and PBDE are not used in this device at all.
- 4) This product shall not contain the following materials.  
Also, the following materials shall not be used in the production process for this product.  
Materials for ODS : CFCs, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methylchloroform)

5) Compliance with each regulation

6.5.1 The RoHS directive(2002/95/EC)

This product complies with the RoHS directive(2002/95/EC) .

Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

6.5.2 Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic Information

Products Regulation (Chinese : 电子信息产品污染控制管理办法).

Category	Toxic and hazardous substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr <sup>6+</sup> )	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Optical Data communication transceiver	✓	✓	✓	✓	✓	✓

✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006 standard .

6) Product mass : T.B.D.

7. Notes

- 1) Before the circuit design  
In circuit designing, make allowance for the degradation of the light emitting diode output that results from long continuous operation. (50% degradation/5 years)
- 2) Regarding to prevention of malfunction  
To prevent photo sensor from faulty operation caused by external light, do not set the detecting face to the external light. Also, if some other electronic components are located close to this device, false operation may occur. (The light reflection caused by the other components may slip into the photodetecting portion of the device and if may cause false operation.)
- 3) The distance between the photo sensor and the object to be detected shall be determined the distance by referencing attached graph "Vo output vs. distance".
- 4) For soldering  
T.B.D.

# REFERENCE

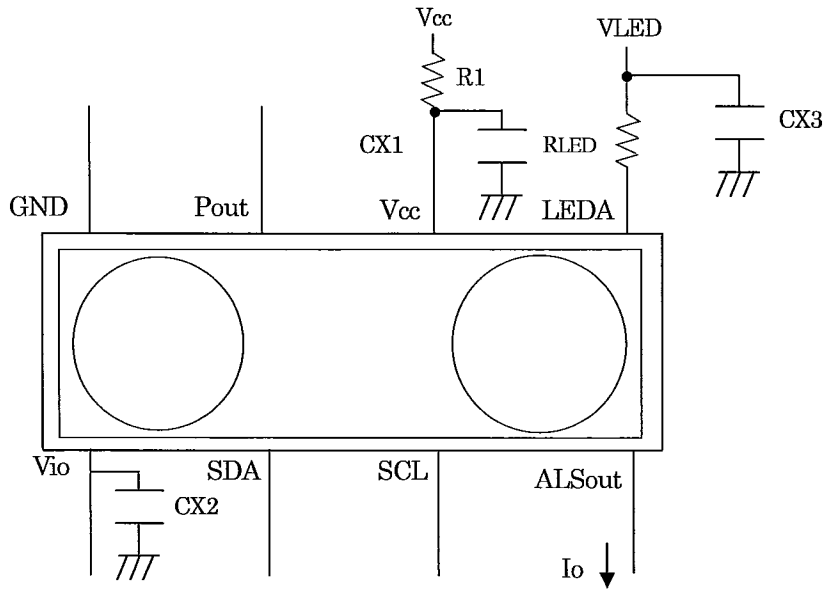
5) For cleaning

Cleaning shall carry out as the below items to avoid keeping solvent, solder and flux on the device.

- (1) Solvent cleaning : Solvent temperature 45°C or less, Immersion for 3 min or less
- (2) Ultrasonic cleaning : Please don't carry out ultrasonic cleaning.
- (3) The cleaning shall be carried out with solvent below.

Solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

6) Recommended external circuit

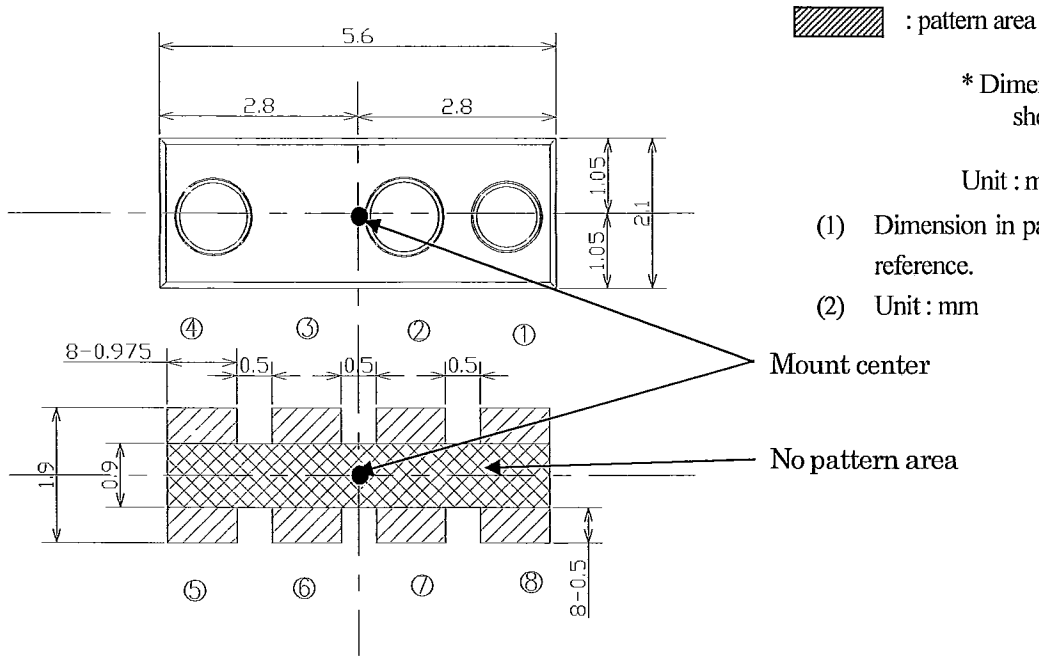


Components		Recommended values
CX1		T.B.D.
CX2		T.B.D.
CX3		T.B.D.
R1	1/16W	T.B.D.
RLED	T.B.D	T.B.D.

# REFERENCE

7) Foot pattern of PCB

(1) Dimension are shown for reference.



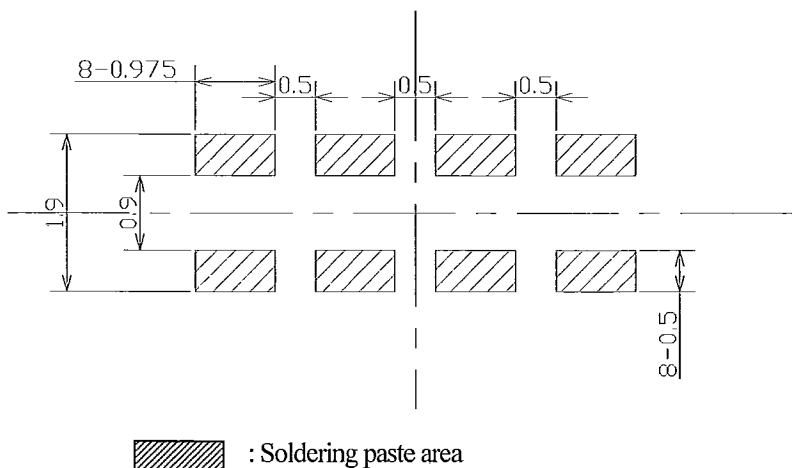
\* Dimension in parenthesis are shown for reference.

Unit : mm

- (1) Dimension in parenthesis are shown for reference.
- (2) Unit : mm

Pin	Pin name	Symbol
①	LED Anode	LEDA
②	Supply Voltage	Vcc
③	Proximity output	Pout
④	Ground	GND
⑤	Logic I/O Voltage	Vio
⑥	I2C DATA BUS	SDA
⑦	I2C CLOCK	SCL
⑧	ALS output	ALSout

(2) Recommendable size of solder creamed paste (Reference)

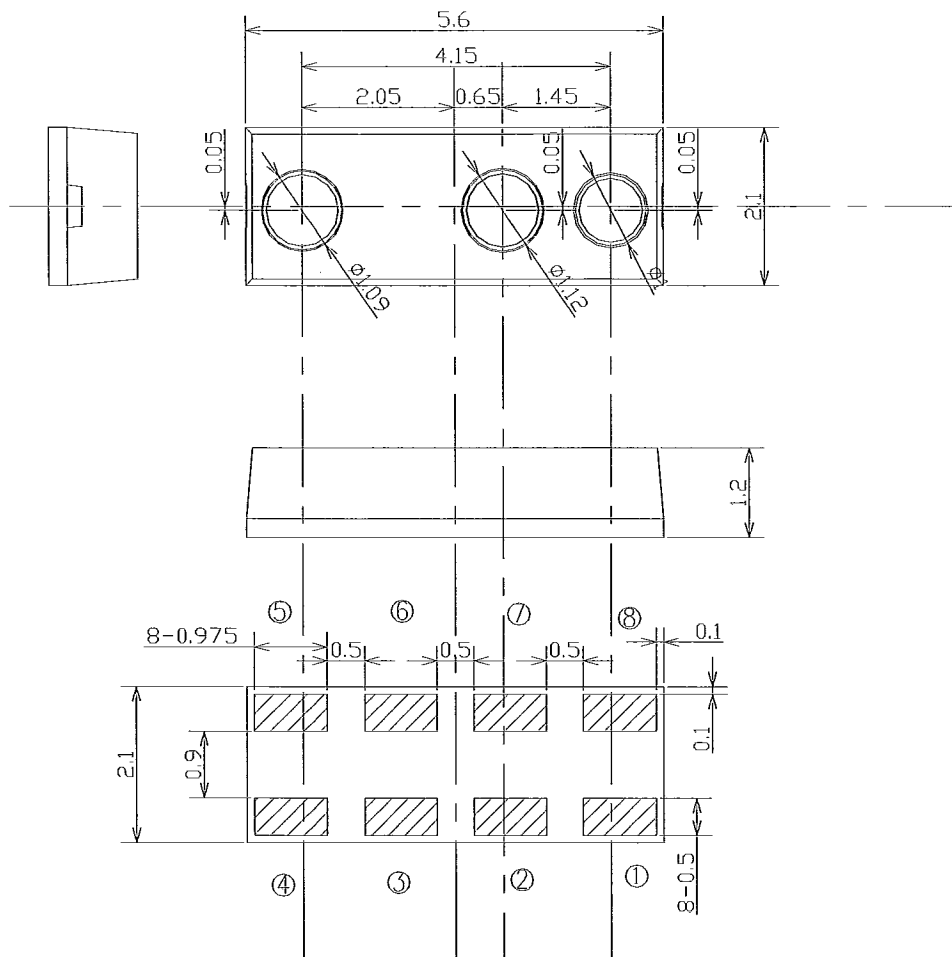


\* Dimension in parenthesis are shown for reference.

Unit : mm

# REFERENCE

## 2. Outline Dimensions (Drawing No. CY14466i02)



Pin	Pin name	Symbol
①	LED Anode	LEDA
②	Supply Voltage	Vcc
③	Proximity Output	Pout
④	Ground	GND
⑤	Logic I/O Voltage	Vio
⑥	I2C DATA BUS	SDA
⑦	I2C CLOCK	SCL
⑧	ALS Output	ALSout

- 1) area: Au plating
- 2) Unspecified tolerance shall be  $\pm 0.2$ .
- 3) Adhesion of resin to the terminal area shall be allowed Max. 0.2mm.

SCALE	MATERIAL	FINISH	Name
10/1	Terminal: Cu	Terminal: Ni( $\geq 3\mu\text{m}$ ), Au( $\geq 0.1\mu\text{m}$ )	Proximity / Ambient Light Sensor GP2AP002A00F
UNIT	Package: Epoxy resin		
1 = 1/1 mm			DRAWING No. CY14466i02

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25°C

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	-0.3 to 3.8	V
LED Supply voltage	VLED	-0.3 to 4.6	V
Logic I/O levels	Vio	-0.3 to Vcc+0.3	V
LED forward current	I <sub>LED<sub>F</sub></sub>	50	mA
LED peak forward current	I <sub>LED<sub>FM</sub></sub>	T.B.D.	mA
ALS output current	I <sub>o</sub>	1	mA
Operating temperature	T <sub>opr</sub>	-25 to +85	°C
Storage temperature	T <sub>stg</sub>	-40 to +85	°C
*1 Soldering temperature	T <sub>sol</sub>	260	°C

\*1 Soldering time : 260°C 10s or less

3.2 Recommended operating conditions

Parameter	Symbol	Operating condition	Unit	Remark
Supply voltage	Vcc	2.4 to 3.2	V	
LED Supply voltage	V <sub>LED</sub>	2.4 to 4.6	V	RLED = T.B.D.
Operating temperature	T <sub>opr</sub>	-25 to 85	°C	
Ambient Light sensing dynamic range	D	3 to 55000	lx	
Logic I/O levels	Vio	1.65 to Vcc	V	
SCL, SDA input low level	VIL	-0.3 to 0.2 × Vio	V	
SCL, SDA input high level	VIH	0.8 × Vio to Vio+0.3	V	

3.3 Rating and characteristics

(T<sub>opr</sub>=25±5°C, Vcc=3.0V Unless otherwise specified )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
<b>Input</b>						
Current consumption	I <sub>cc</sub>	—	570	—	μA	No detection object, Ev=0 lx
<b>Transmitter</b>						
LED peak current	I <sub>LED</sub>	—	T.B.D.	—	mA	
Peak emission wavelength	λ <sub>p</sub>	—	940	—	nm	
<b>Proximity Sensing Output</b>						
Pout terminal High level output voltage	V <sub>OH</sub>	Vio-0.5	Vio-0.3	Vio+0.3	V	I <sub>OH</sub> =0.3mA, *5
Pout terminal Low level output voltage	V <sub>OL</sub>	—	—	0.5	V	I <sub>OL</sub> =1mA, *5
Response time (H→L)	t <sub>PHL</sub>	—	—	50	ms	*5
Response time (L→H)	t <sub>PLH</sub>	—	—	50	ms	
Rise Time	t <sub>r</sub>	—	1	—	μs	*5, CL=15pF
Fall Time	t <sub>f</sub>	—	1	—	μs	
Maximum detection distance	L <sub>on</sub>	20	—	—	mm	*6, detection object KODAK Grey Cards
Minimum No detection distance	L <sub>off</sub>	—	—	150	mm	
Receiver wake up time	t <sub>sdw</sub>	—	—	100	ms	No input signal
Maximum acceptable illuminance	N	3000	—	—	lx	*7, at non detection
<b>I<sup>2</sup>C (*3.4)</b>						
SCL clock frequency	SCL	T.B.D.	—	400	kHz	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
<b>Ambient Light Sensing Output</b>						
Output current 1 *1,*2	Io1	16	20	24	$\mu$ A	Ev=100 lx
Output current 2 *1,*2	Io2	27	30	33	$\mu$ A	Ev=1000 lx
Output current 3 *1,*2	Io3	—	—	1	$\mu$ A	Ev=0 lx
Temperature Coefficient	$\alpha$ 1	—	—	0.25	%/ °C	Ta=-30°C to +70°C, Ev=1000 lx
	$\alpha$ 2	—	—	0.2	%/ °C	Ta=0°C to +50°C, Ev=1000 lx
Peak sensitivity	$\lambda$ p		555		nm	
Rise time	tr1		—	150	$\mu$ s	Ev=100 to 55000lx, R=27k $\Omega$ ,*3
	tr2	—	—	5	ms	Ev=3 to 55000lx, R=27k $\Omega$ ,*3
Fall time	tr1	—	—	150	$\mu$ s	Ev=100 to 55000lx, R=27k $\Omega$ ,*3
	tr2	—	—	15	ms	Ev=3 to 55000lx, R=27k $\Omega$ ,*3
Output current difference	$\Delta$ I	-2	—	2	$\mu$ A	Io(incandescent lamp Ev=100lx) - Io(fluorescent lamp Ev=100lx)*4

\*1 Ev : Illuminance by CIE standard light source A (tungsten lamp)

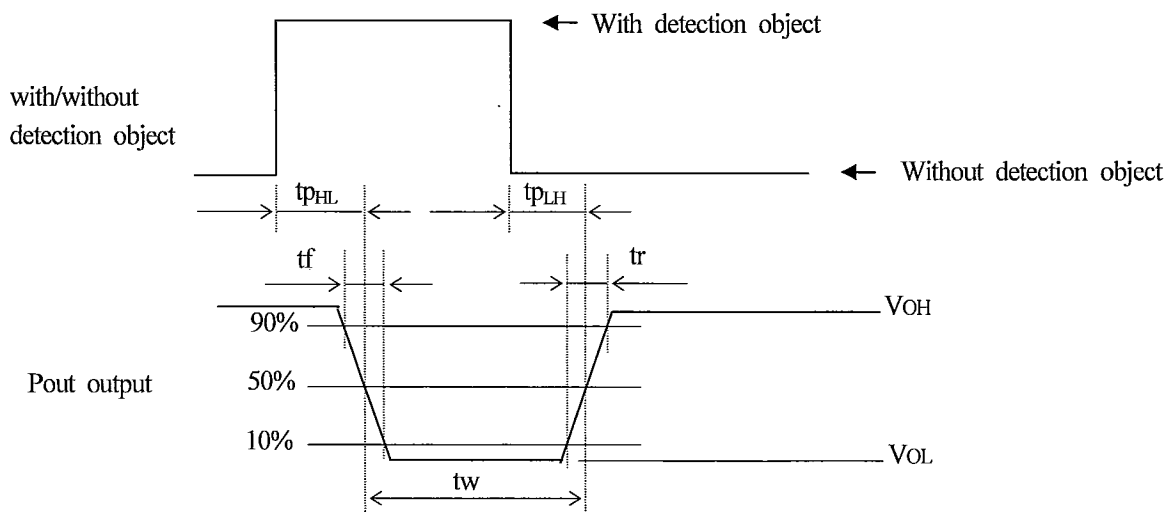
\*2 Ambient Light Sensor output vs. illuminance is logarithmic.

$$I_o = 10 \times \log(E_v) \quad (\mu A)$$

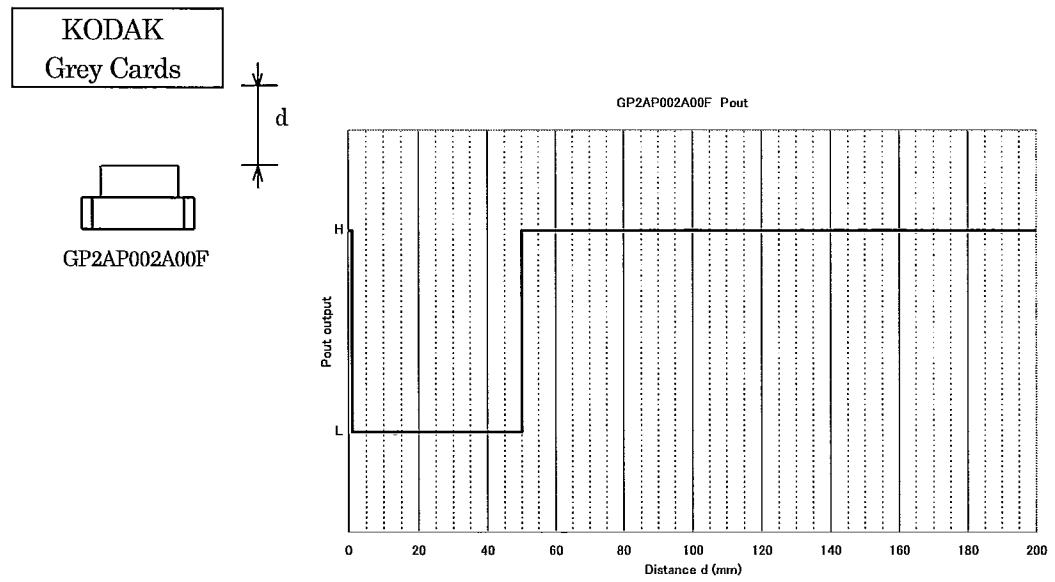
\*3 Ev : Illuminance by white LED.

\*4 White LED is used by white LED

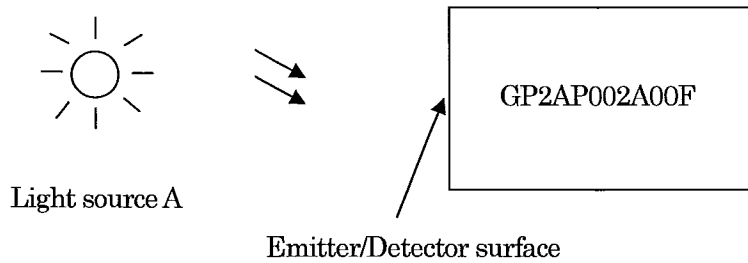
\*5 Pout waveform specification (Detector side)



※ 6. Detection distance (Pout output at normal mode)

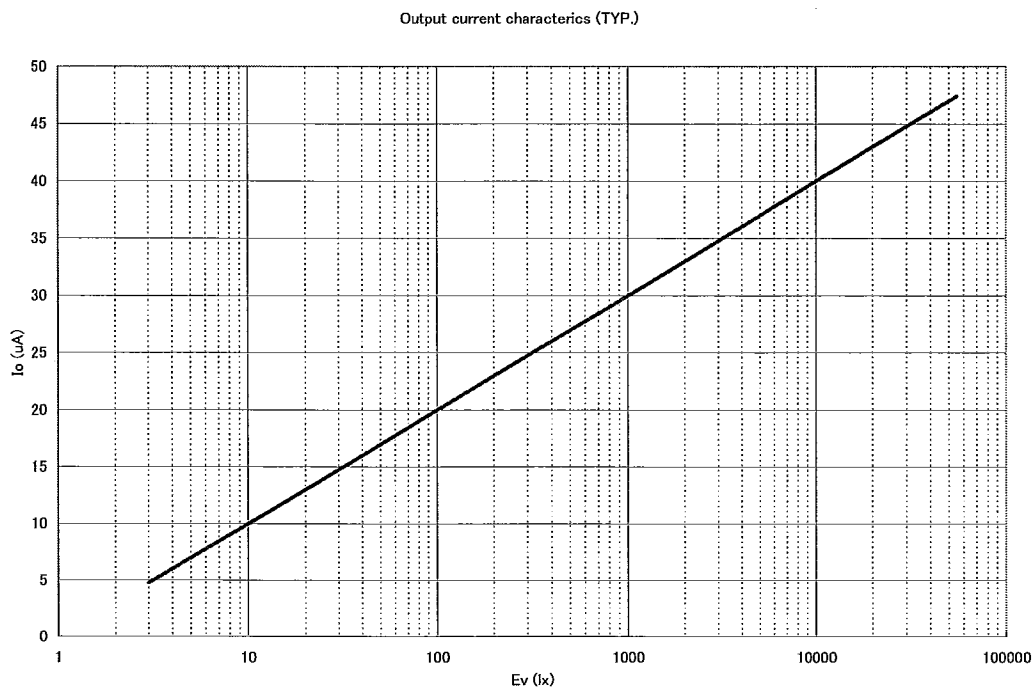


※ 7. Test measurement method for maximum acceptable illuminant of external disturbing light



Illuminance shall be the illuminance on the emitter/detector surface.  $V_o$  should not change “H” to “L”.

8. ALS output current Characteristics (TYP.)





3.4 I<sup>2</sup>C bus interface (proximity information)

GP2AP002A00F is operated as I<sup>2</sup>C **slave** on the I<sup>2</sup>C bus.

3.4.1. fundamental operation description

Pin name	Description
SCL	I <sup>2</sup> C Clock
SDA	I <sup>2</sup> C Data Input/Output

3.4.2. fundamental data format

It follows fundamental data format.

SLAVE ADDRESS :

A6	A5	A4	A3	A2	A1	A0	R/W
1	0	0	0	1	0	0	X

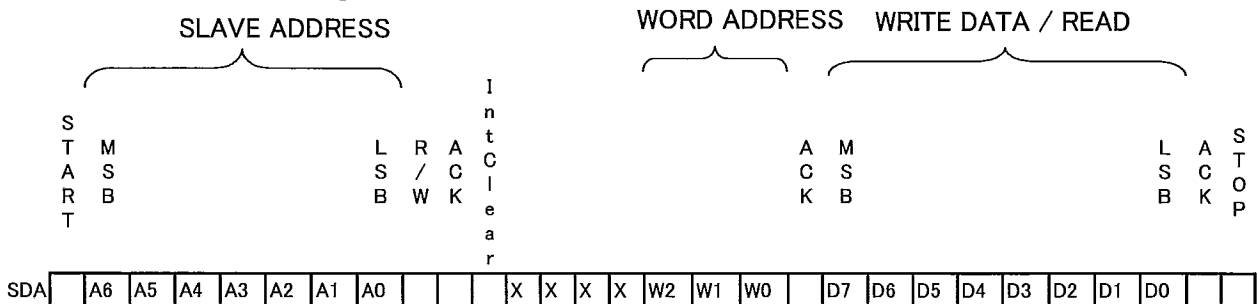
R/W: Read:1, Write:0

WORD ADDRESS : When the master writes, the master choose 3bits : W0~W2 as internal register address.

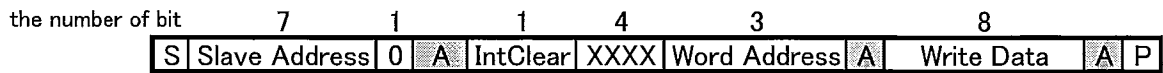
In reading, the master doesn't need to specify. (reference : 3.4.5. internal register map)

WRITE/READ DATA : is the data which is written in internal register and read from internal register.

IntClear : can clear interrupt.

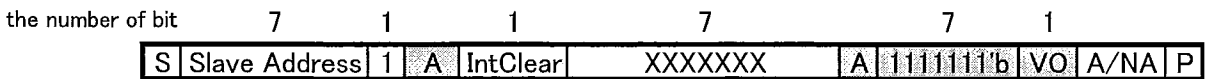


3.4.3. WRITE format



A:ACK, S:START, P:STOP, X:don't care  
 IntClear: ( 1:clear interrupt 0:not clear )  
:Master      :Slave

3.4.4. READ format



A:ACK, NA:NACK, S:START, P:STOP, X:don't care  
 IntClear: ( 1: clear interrupting, 0 : don't clear )  
 VO : proximity output  
:Master      :Slave

3.4.5. internal register map

ADDRESS	SYMBOL	DATA								Initial Value	R/W	
		D7	D6	D5	D4	D3	D2	D1	D0			
0 0H	PROX	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	VO	H'00	R
1 1H	GAIN	⊗	⊗	0	0	LED[0]	0	0	0	H'00	W	
2 2H	HYS	⊗	⊗	HYSC[1]	HYSC[0]	⊗	⊗	⊗	⊗	H'00	W	
3 3H	CYCLE	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	H'00	W	
4 4H	OPMOD	⊗	⊗	0	0	0	0	VCON	SSD	H'00	W	

⊗ shows N/A.

VO : proximity output register ( 0 : no detection, 1 : detection )

Prohibit WRITE

LED[0] : LED drive current in 2 levels ( 0 : small, 1 : large )

HYSC[2:0] : receiver sensitivity change in 3 levels T.B.D.

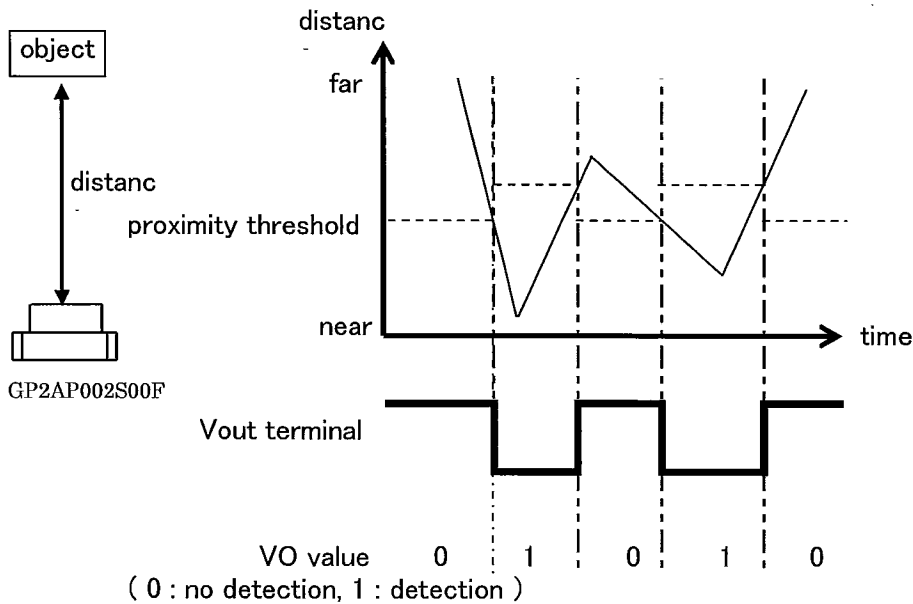
SSD : software shutdown ( 0 : shutdown mode, 1 : operating mode )

VCON : VCON switch ( 0 : normal output mode, 1 : interrupt output mode )

3.4.6. normal output mode

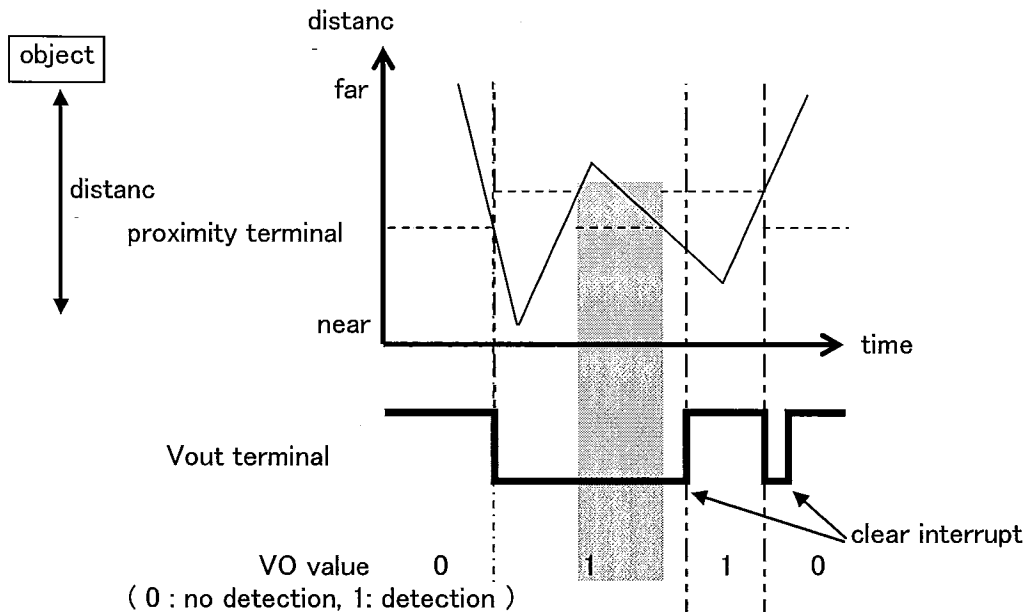
When VCON register is "0", this product operates as normal output mode.

Pout terminal is turned from "H" to "L" in this mode, when the object is detected.

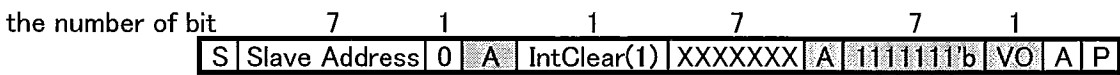


3.4.7. interrupt output mode

When VCON register is "1", this product operates as interrupt output mode.  
Pout terminal is turned from "H" to "L" in this mode when the detection state is changed.



• READ format on interrupt output mode



A:ACK, S:START, P:STOP, X:don't care  
 IntClear: clear interrupt(1: clear interrupt, 0:don't clear)  
 VO : proximity output  
 □:Master      ■:Slave

3.4.8. software shutdown

This product is on shutdown mode, when the power supply is turned on.

3.5 Schematic

