

Designing with the GP2Y0D805Z0F and GP2Y0D810Z0F

Application Note

February 2007

In-depth discussion of operation characteristics, how the sensors perceive certain types of surfaces, connection diagrams and timing information.

GP2Y0D805Z0F/810Z0F Application Note

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1. General Description

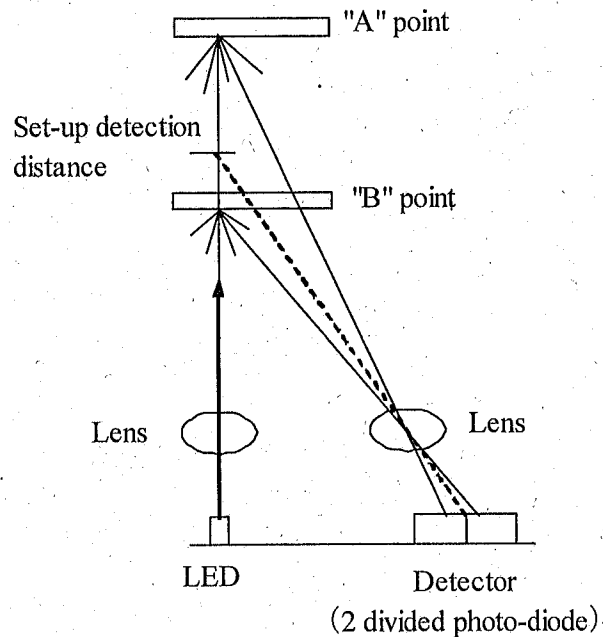
This GP2Y0D805Z0F/810Z0F application note has been completed by preparing several characteristic data for customers' convenient reference when the GP2Y0D805Z0F/810Z0F are used.

Please utilize this application note for customers' design. This application note should be for reference, however please make sure them in actual mounted condition before using.

2. Measuring principle and features of this sensor

2-1. Principle of triangulation

Optical spot position on the detector (2 divided photo-diode) shall be changed when reflective object is at "A" point and at "B" point. In case that the position of the photodiodes is set as the reflected light at the setup detection distance makes a spot on the center of the photodiodes, the reflected light at "A" point comes onto the left photodiode and the reflected light at "B" point comes onto the right photodiode. So by processing the detecting light amount ratio between these two photodiodes, this sensor can judge as a detection at "B" point and a non-detection at "A" point.



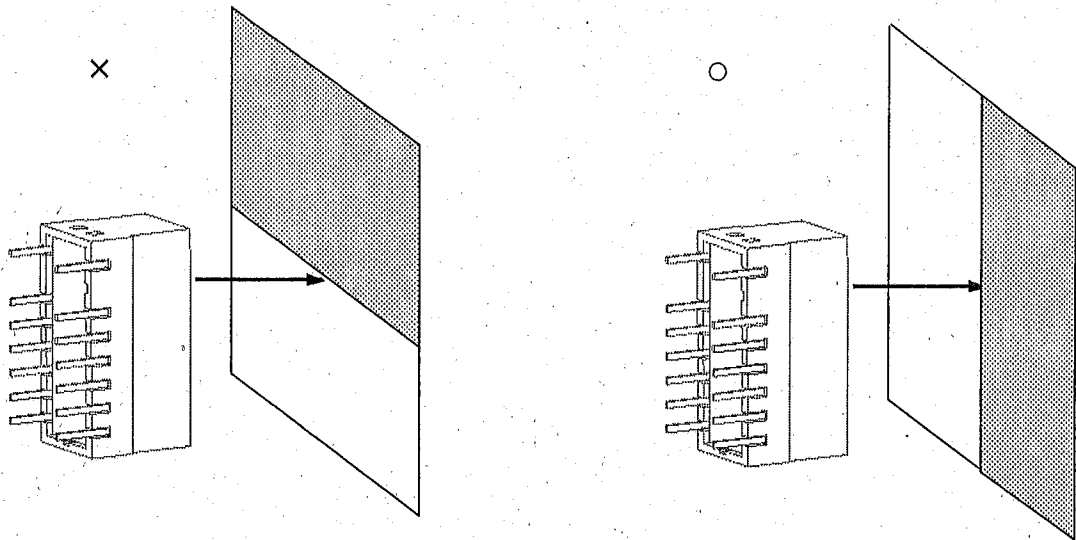
2-2. Features of this GP2Y0D805Z0F/810Z0F

- 1) Low consumption current Typ. 0.057mA at 0.5sec intermittent drive
- 2) Wide supply voltage range 2.7V ~ 6.2V
- 3) Shortening of measuring duration Typ. 2.56ms
- 4) Compact package
- 5) Intermittent drive can be controlled easily by input signal pin
- 6) 2 photodiodes, LED and signal processing circuit IC are built in.
- 7) Little influence by color and reflective ratio of the reflective object

3. Attended issues in use

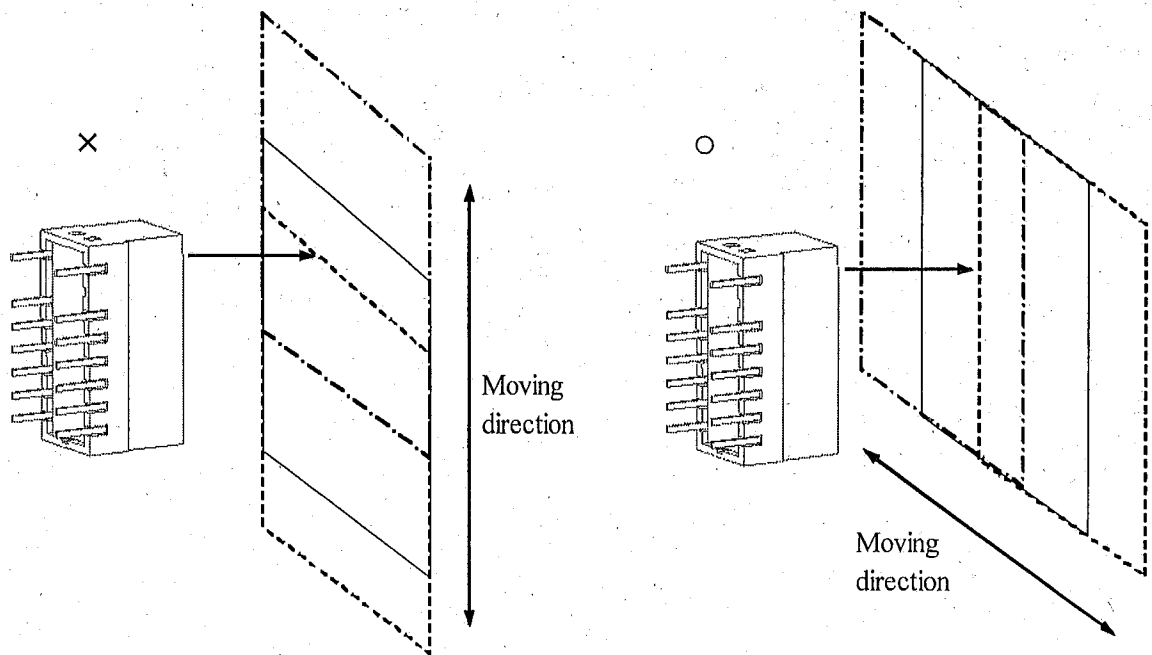
3-1. Direction of the reflective object

In case that reflective object has boundary line which material or color etc. are excessively different, in order to decrease deviation of measuring distance, it shall be recommended to set the sensor that the direction of boundary line and the line between emitter center and detector center are in parallel.



3-2. Moving direction of moving reflective object

In order to decrease deviation of measuring distance by moving direction of the reflective object, it shall be recommended to set the sensor that the moving direction of the object and the line between emitter center and detector center are vertical.



3-3. External disturbing light resistance characteristics

If the direct light from light source such as the sun, Tungsten lamp etc. comes into the detector surface, there are cases that it can not measure exactly. Please consider the design that the direct light from such light source does not come into the detector surface.

These sensors are designed to hold non-detection status forcibly to avoid a distance measuring error which output detection regardless no objects exist in case that a disturbing light more than 10,000lx ~ 20,000lx comes into.

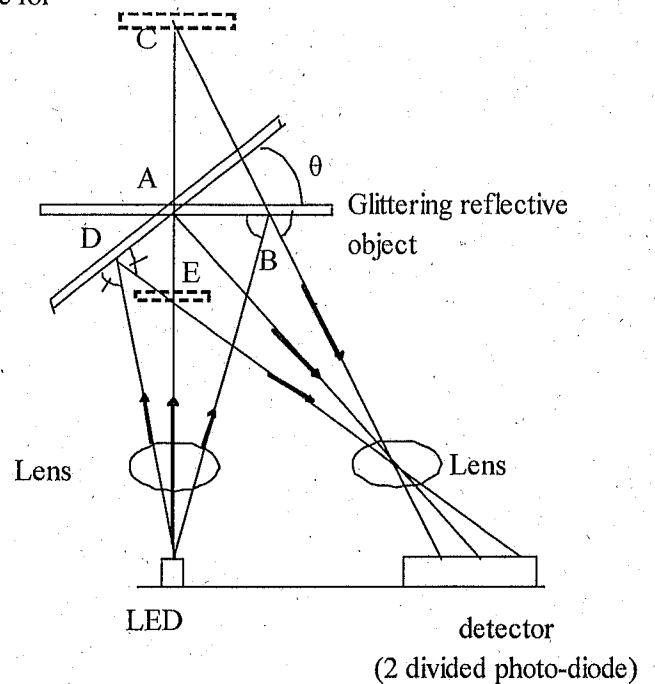
3-4. Output at glittering reflective object

3-4-1. In case of glittering reflective object with no diffused reflective light ingredient (Mirror, Glass etc.)

LED light beam has an expanse. (Half intensity angle for LED in GP2Y0D805Z0F/810Z0F : $\Delta\theta=2$ deg.)

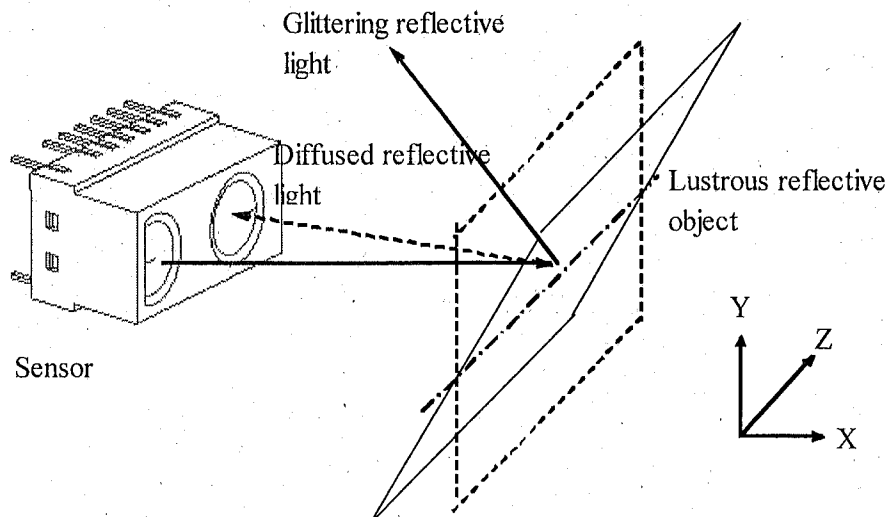
Therefore, in case that there is glittering reflective object at "A" point in the right drawing, the glittering reflected light comes into the detecting device from "B" point and it shall be the same output when there is the diffused lustrous reflective object at "C" point, so that accurate measuring is not possible.

In addition, in case that a glittering reflective object inclines at "A" point as the center by θ , the glittering reflected light comes into the detecting device from "D" point and it shall be the same output when there is the diffused lustrous reflective object at "E" point, so that accurate measuring is not possible.



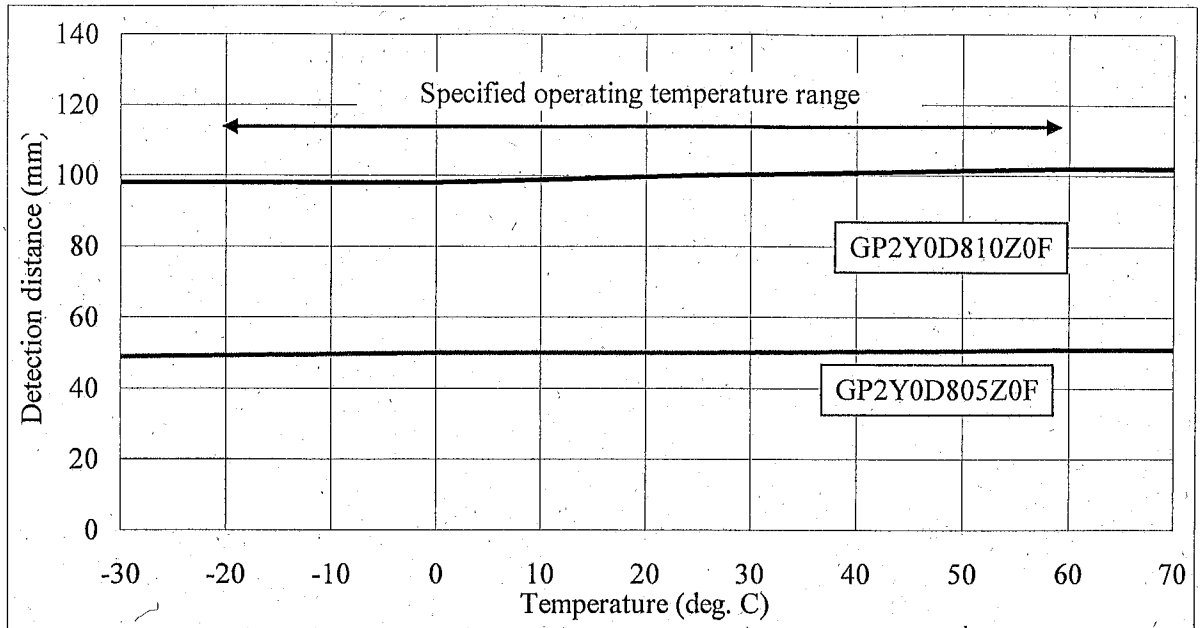
3-4-2. In case of lustrous reflective object with diffused reflective light ingredient (painted metal, Colored vinyl etc.)

In case that lustrous reflective object with diffused reflective light ingredient shall be measured, accurate measuring for the distance between the sensor and the object is possible by tilting the lustrous reflective object like the following drawing since the glittering reflective light ingredient runs away to "Y" direction and the diffused reflective ingredient comes into the detecting device (2 divided photo-diode).



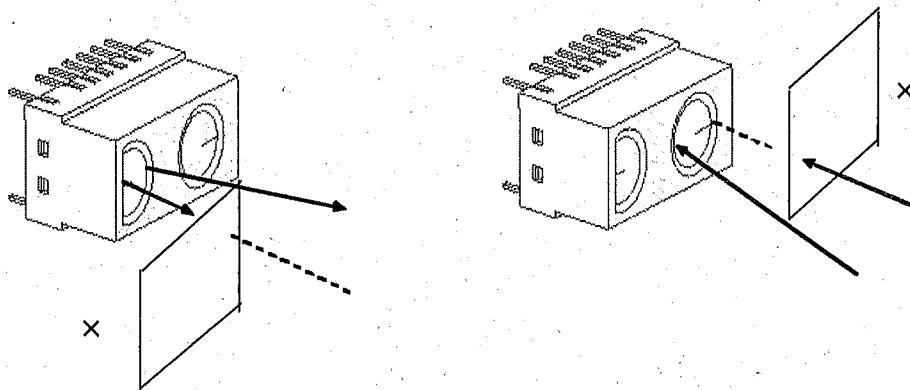
3-5. Ambient temperature

Ambient temperature characteristics of the GP2Y0D805Z0F/810Z0F as example is following.

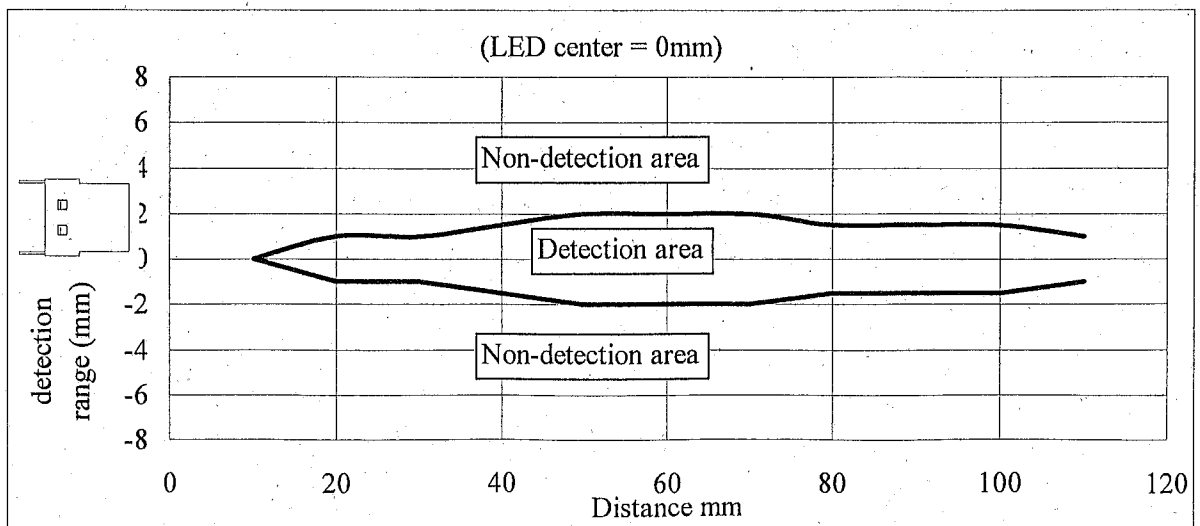


3-6. Optical conditions in front of the sensor

1) Please consider that there is no object which interrupt the LED beam from sensor or no object which interrupt the reflective light from the reflective object to the detector portion.



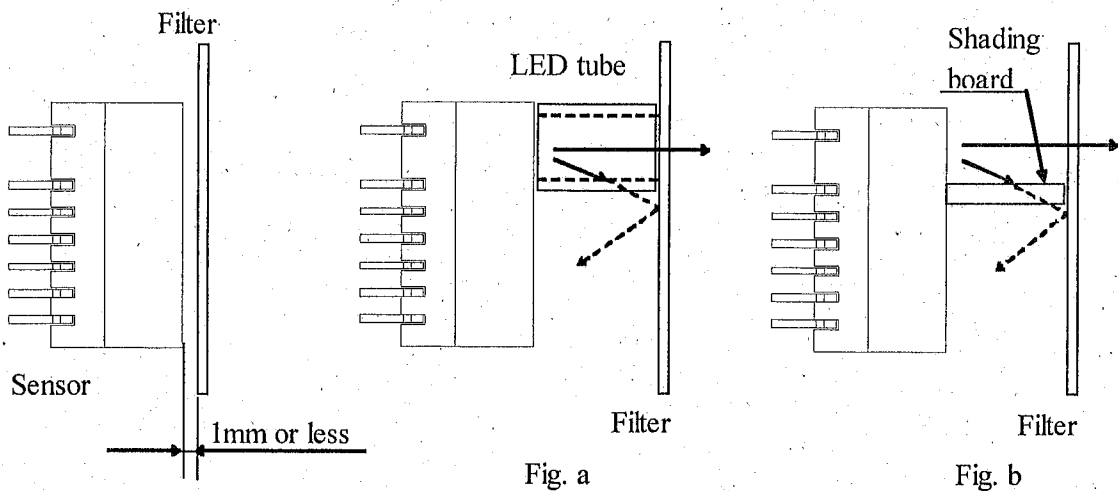
2) Detectable area characteristics of GP2Y0D810Z0F as example is following.



3) In case that an optical filter is set in front of the sensor, the filter must have high transmittance with emitted spectrum wavelength of LED ($\lambda=870\text{nm} \pm 70\text{nm}$) which is used in the sensor, please use the filter whose surface is face and back mirror. (When there's like sand brushing on the surface, there is a case that the light is diffused inside of the filter, so the filter is sometimes detected.)

Also, the clearance between the sensor and the optical filter should be set at 1mm or less. In case that the clearance is 1mm or more, in order to avoid the light emitting from the filter to the detector, which is emitted from LED and is glittering reflected by the filter, the following would be recommended.

- a) Set a tube to the filter on emitter side
- b) Set a shading board between emitter lens and detector lens.

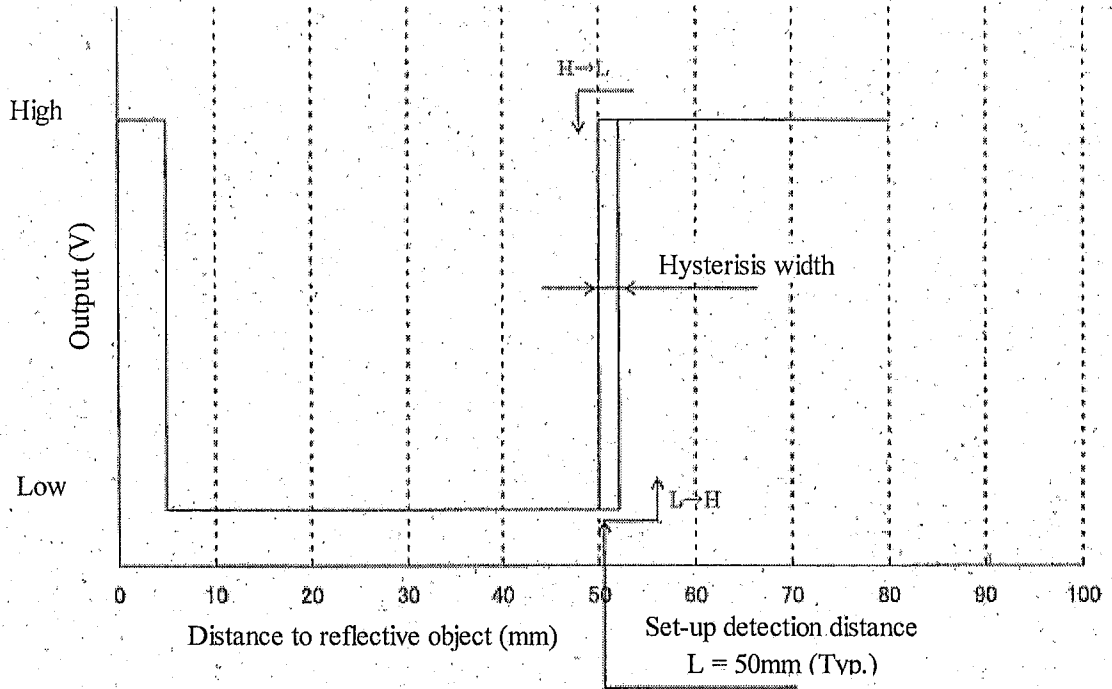


Acrylic or Polycarbonate resin would be recommended as the material of the filter. Please be careful to use ABS resin or molded transparent resin with coating since there is a possibility to be a cause of operating error by reflected light reaches to the detector inside of the filter.

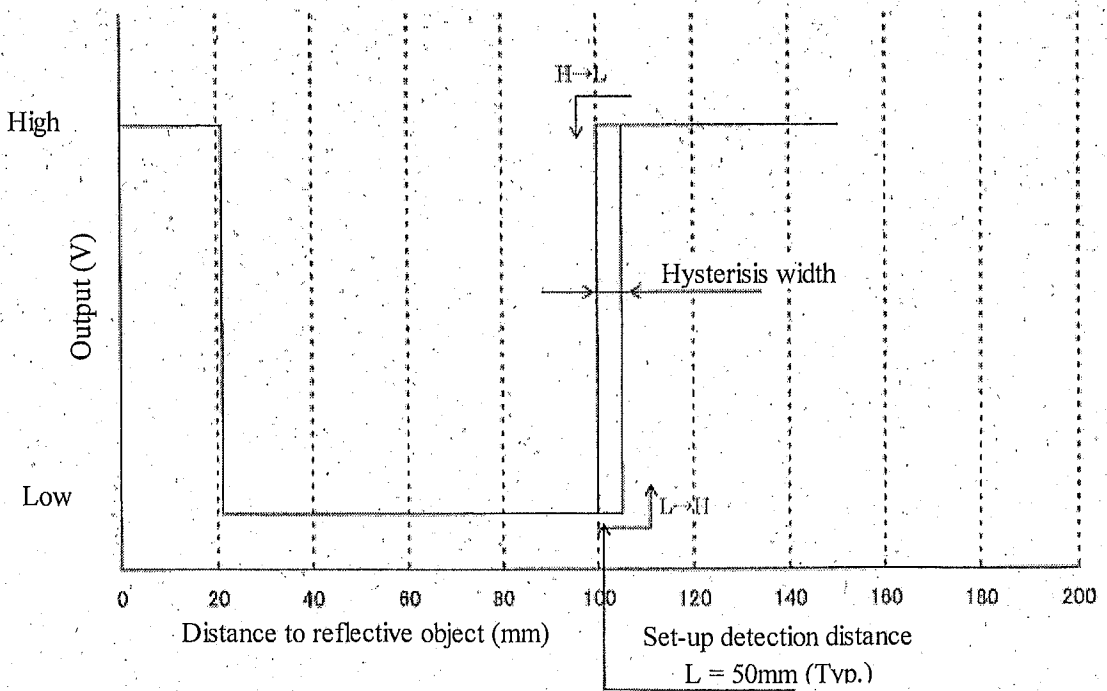
When an optical filter is used, please use it after confirming the operation in actual application.

4. Characteristics of GP2Y0D805Z0F/810Z0F

4-1. Output characteristics of GP2Y0D805Z0F

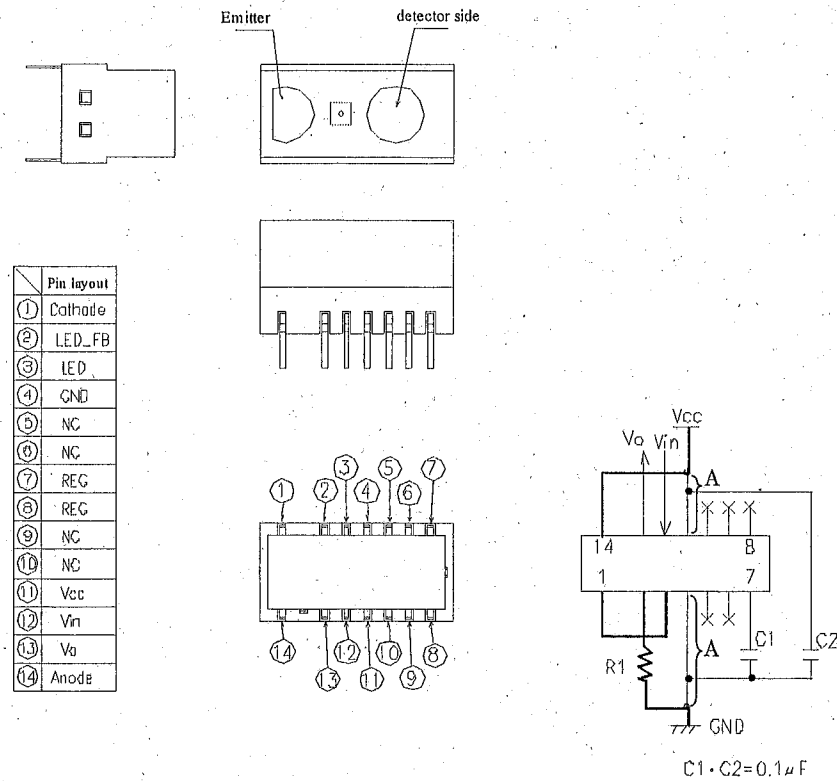


4-2. Output characteristics of GP2Y0D810Z0F



5. Connecting diagram and timing chart

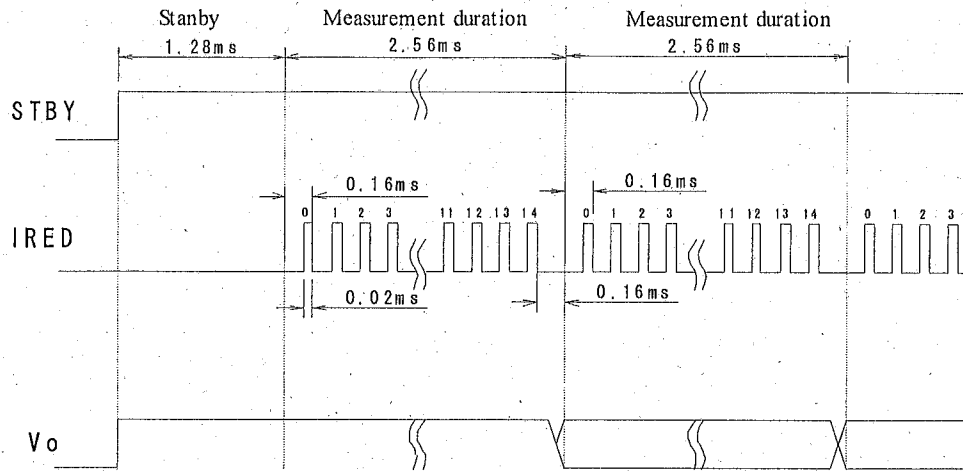
5-1. Pin layout and connecting diagram



5-1-1. Precautions for connection

- > The bold lines in the above connecting diagram indicate wires which have a large current to drive LED.
- Please layout a by-pass capacitor(C2) between Vcc and GND as close to the sensor terminals as possible for stabilizing the power supply to the sensor.
- The by-pass capacitor(C2) shall be located within the range shown by "A", so it should not be connected at the bold line area.
- > Since the output might be unstable by line noise in case of connecting a board assembled sensor to a main board, etc. with a long wiring, please use it after confirming the operation in actual application.
- > An improvement might be occurred to increase capacitance of the by-pass capacitor between Vcc and GND in case of the unstable output due to noise caused by ambient environment, etc.
- > Please do not change the capacitance of the capacitor connecting to the regulator terminal (C1=0.1μF).

5-2. Timing chart



LED in these sensor emits maximum 15 times (4 times data sampling per one emission) and the sensor stop the LED emission once the output is settled by having 30 times detection or non-detection. So the minimum LED emission is 8 times for the shortest operation and the maximum LED emission is 15 times for the longest operation.

Low power dissipation is realized with controlling LED emission by this method.

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