SPECIFICATION

Product Name: LED Particle Sensor

Item: PM1006K

Version: V0.5

Date: 2020-12-28

Revision

No.	Version	Content	Date
1	V0.1	First edition	2018.03.06
2	V0.2	Adding PWM communication	2018.04.24
3	V0.3	Add temperature influence curve	2018.08.28
4	V0.4	Modify the photoelectric linear	2018.11.06
5	V0.5	Update dimension and package information	2020.12.28

Infrared LED Particle Sensor PM1006K

Introduction

Infrared LED particle sensor module PM1006K adopts the principle of optical scattering to detect the variation trend of particle (size between 1μm to 10μm) concentration in the air. There is an infrared light-emitting diode and an optoelectronic sensor built-in PM1006K, and light rays from the light-emitting diode will be reflected when pass through the particle. The optoelectronic sensor can show the concentration of particle in the air by detecting the intensity of reflected light. Sensor can output measuring value by pulse or UART signal.

Principle

According to the scattering principle of light,
The LED light generates reflected light when meet particles. Photoelectric diode detects the light intensity of reflected light, judging the particle concentration according to pulse signal.
Photoelectric diode will output low pulse when do not detect particles. Otherwise, photoelectric diode will output high pulse when detect particles. And pulse signal is in proportion on the detected light intensity. Pulse signal will be magnified by amplifier and calculated by CPU, output measuring result finally.

Features

- ✧ Electromagnetic shielding, anti-interference
- ✧ Small volume, high accuracy
- ✧ Low coil consumption, wide measuring range
- ✧ Quick response

Applications

- ✧ Household air purifier
- ✧ Automobile air purifier
- ✧ Residential and commercial air conditioning
- ✧ HVAC system
- ✧ All kinds of IAQ monitor
- ✧ IoT hardware intelligence

Advantages

- ✧ Integrate MCU, directly output particle mass concentration (μg/m³)
- ✧ Integrated temperature sensor, temperature compensation within the whole temperature range

Table 1. Specification

LED particle sensor specification	
Principle	Light scattering(LED)
Measuring range	0~1000μg/m³
PM2.5 Accuracy	±20μg/m³ or ±20% of reading (@voltage 5.0V, 25±2℃, 50%±10%RH)
Response time	8s
Working condition	-20℃~+75℃, 0~95%RH(non-condensing)
Storage condition	-40℃~+85℃, 0~ 95%RH(non-condensing)
Working voltage	DC 5V±0.2V ripple ＜50mV
Working current	≤30 mA
Signal output	UART：4.5V level; PWM
Size	W46.2*H34.1*D18 mm
MTTF	≥5 year

Internal architecture and principle description

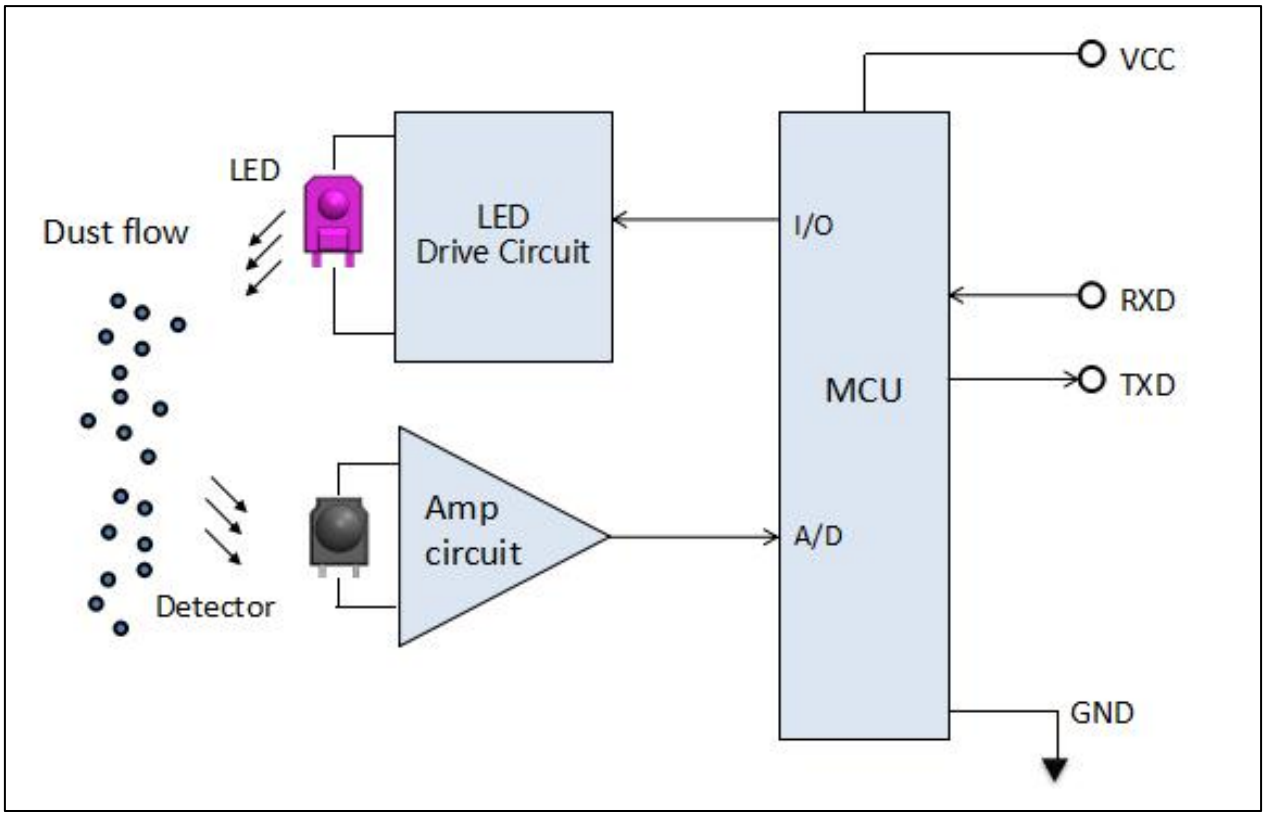


Fig 1 Internal architecture

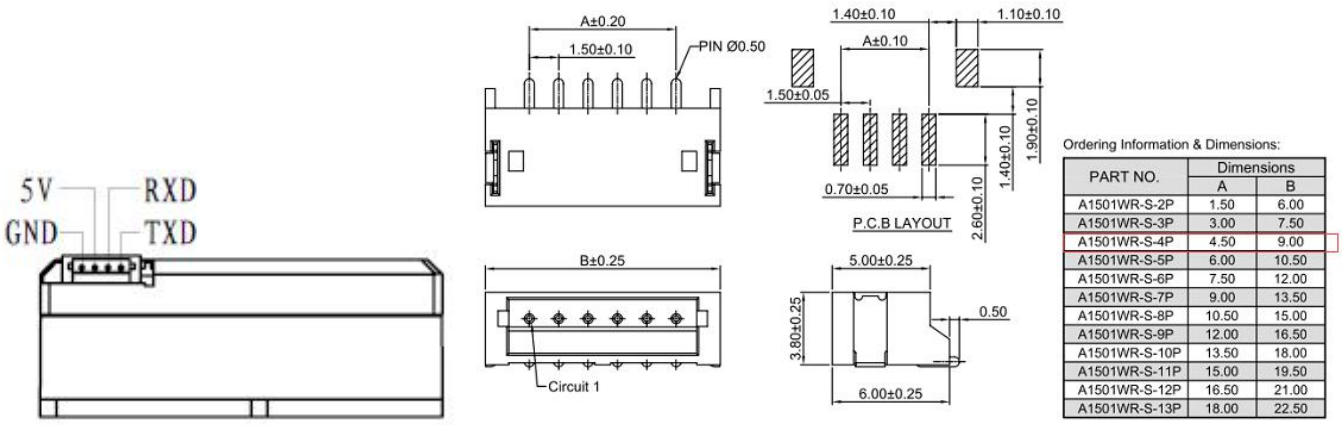
Light scattering principle

According to the above picture, the light source of PM1006K is consist of LED which launch to detecting particles light, front-loading lens and drive circuit. The detecting part is consist of postposition condensing lens, photoelectric part which receives reflected light and amplifying circuit.

The particle measuring principle of PM1006K

The LED light generates reflected light when meet particles. Photoelectric diode detects the light intensity of reflected light, judging the particle concentration according to pulse signal. Electronic signal is disposed by filter circuit and MCU, it will convert into PWM signal output.

I/O definitions and connectors



PART NO.	Dimensions	
	A	B
A1501WR-S-2P	1.50	6.00
A1501WR-S-3P	3.00	7.50
A1501WR-S-4P	4.50	9.00
A1501WR-S-5P	6.00	10.50
A1501WR-S-6P	7.50	12.00
A1501WR-S-7P	9.00	13.50
A1501WR-S-8P	10.50	15.00
A1501WR-S-9P	12.00	16.50
A1501WR-S-10P	13.50	18.00
A1501WR-S-11P	15.00	19.50
A1501WR-S-12P	16.50	21.00
A1501WR-S-13P	18.00	22.50

Fig 2 Connector Dimensions

Table 2. I/O definitions

NO.	Pin	Description
1	GND	Power input (ground terminal)
2	VCC	Power input(+5V)
3	RXD	UART receiving (TTL level @4.5-5V)
4	TXD/PWM	UART sending (TTL level @4.5V)

Table 3.Connector description

Item	Pin space
A1501WR-S-4P	1.5mm pitch

Photoelectric linear

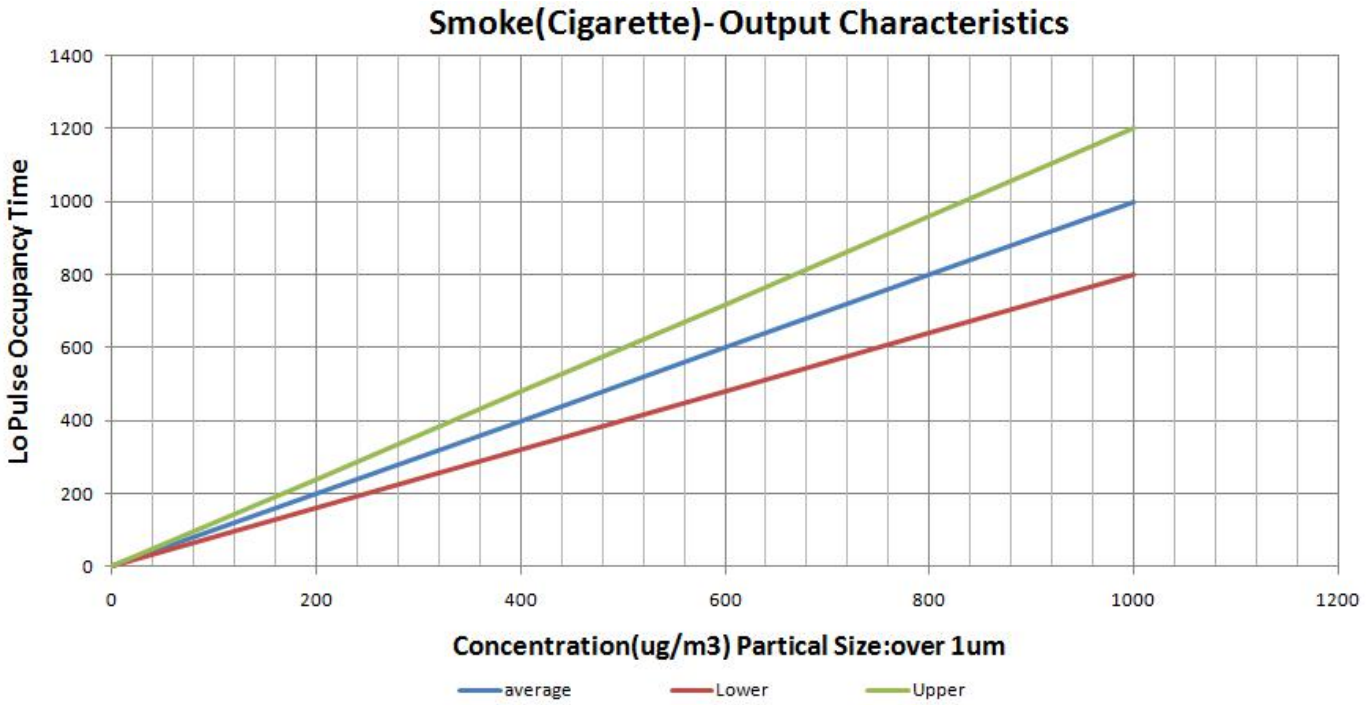


Fig 3 Photoelectric linear

◆The linear curve of the sensor is verified in the following conditions:

The temperature of the environment is 25±2℃

The humidity of the environment is 50±10%RH

Cigarette smoke: Hong Ta Shan 8mg

Temperature influence curve

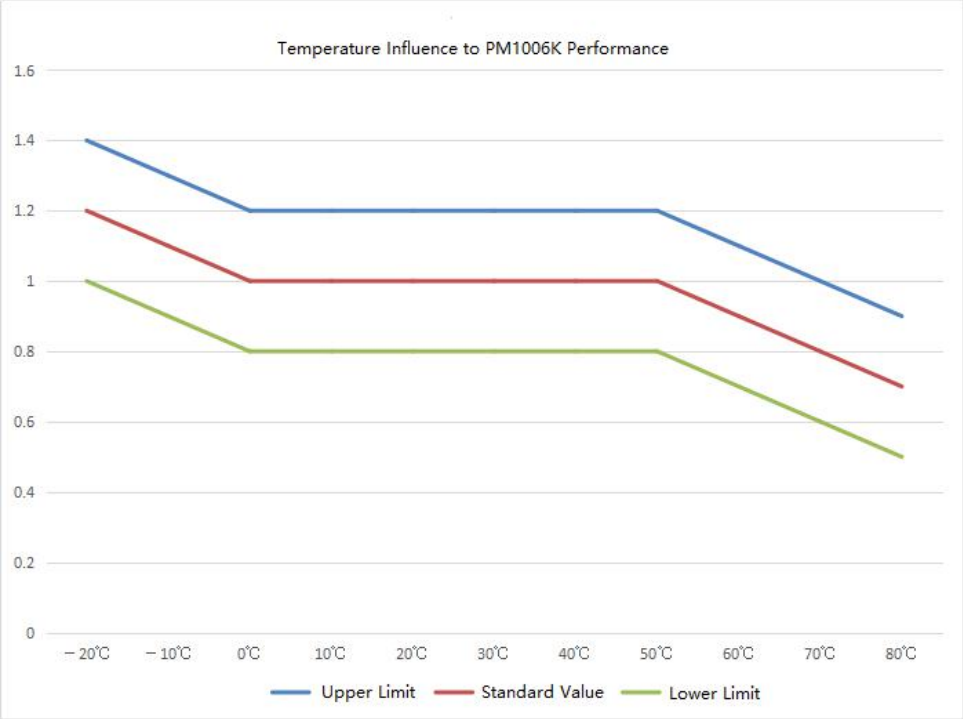


Fig 3 Temperature influence curve

- Normal temperature measuring error: 25℃±2℃, 50±10%RH, 0~1000μg/m³.
- The consistency of PM2.5 is ±20% of reading or ±20μg/m³, use the max value (TSI-8530, cigarette smoke)

Communication protocol

◆**UART communication：**

UART level range

-UART RX: 0~5.0V data input

-UART TX: 0~4.5V data output

UART configuration

-data bit: 8

-Stop bit: 1

-Check bit: non

-Baud rate: 9600bps

Read measures result of particles:

Send: 11 01 02 EC

Response: 16 0d 02 DF1- DF4 DF5- DF8 DF9- DF12 [CS]

Note: PM2.5(μg/m³)= DF3*256+DF4

PM1.0(μg/m³) = DF7*256^1 + DF8

PM10(μg/m³) = DF11*256^1 + DF12

PWM communication

Resolution: 1ug/m3

RSP: Low potential

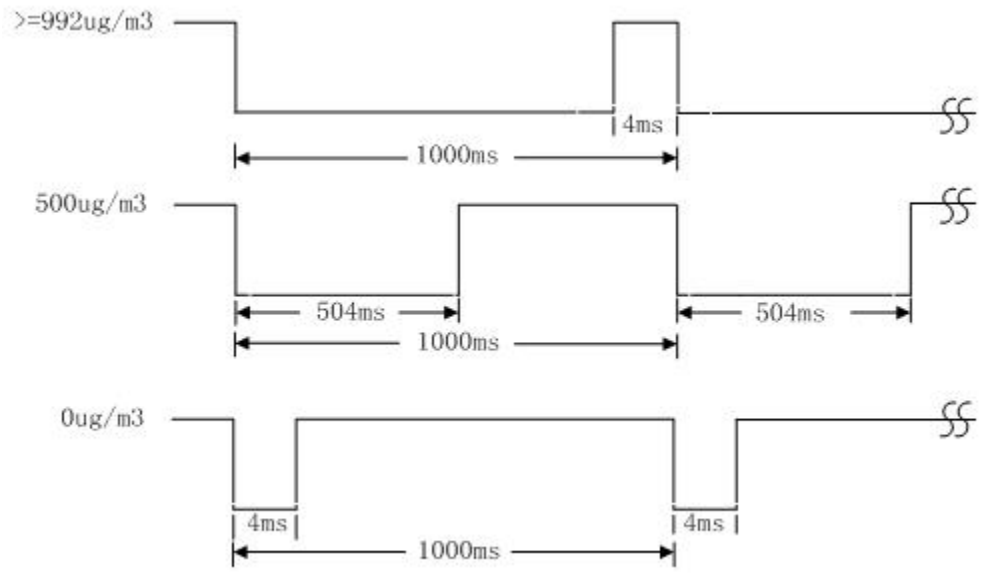
Range: 0~992ug/m3

Cycle: 1000ms

PM2.5 Concentration ug/m3 = low level ms – 4ms;

(PWM: the minimum output low level is 4ms within 1 cycle, the concentration is 0ug/m3

PWM the max output low level is 996ms within 1 cycle, the concentration >=992ug/m3.)



Dimensions

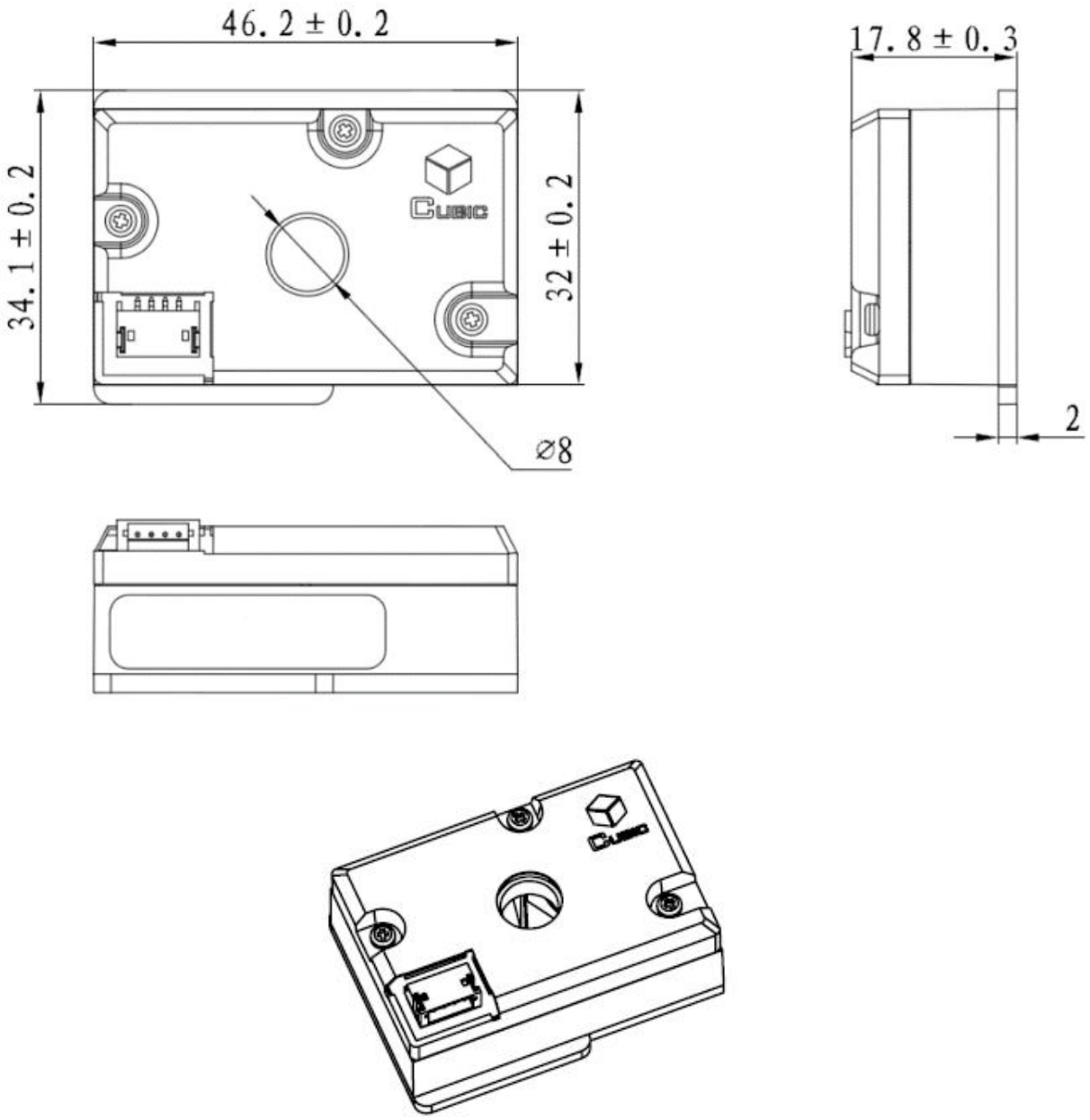
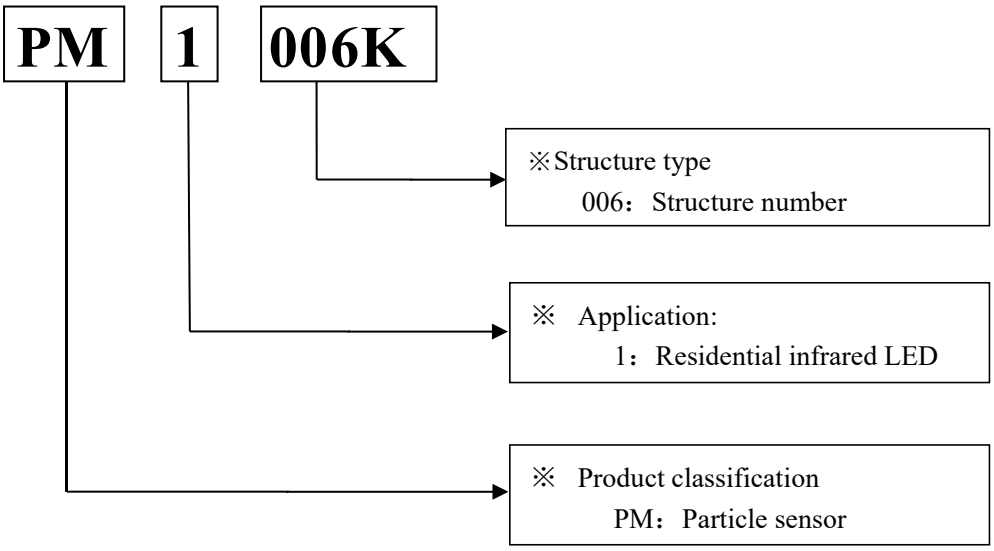
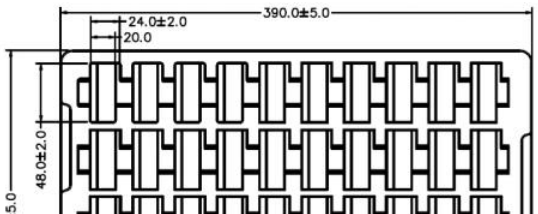


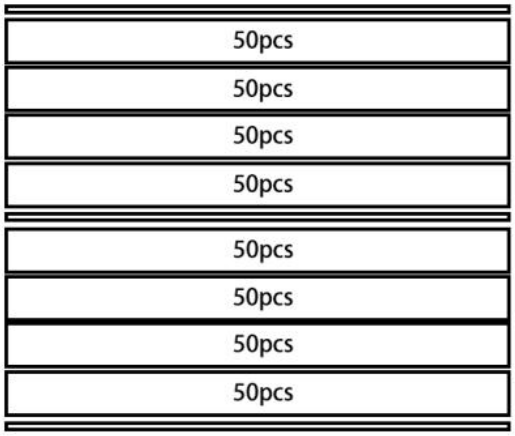
Fig 4 Dimensions (Unit: mm)

Code information

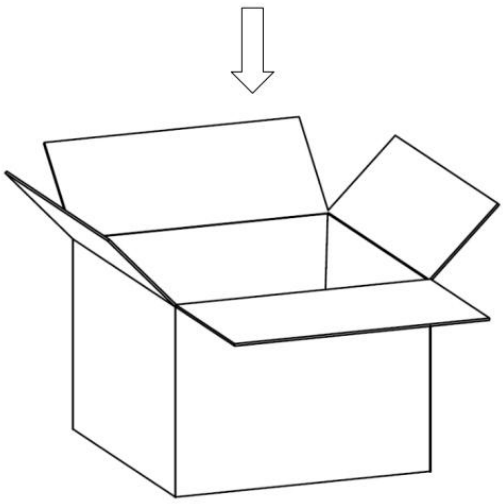

PM
1
006K
※Structure type
006：Structure number
※ Application:
1：Residential infrared LED
※ Product classification
PM：Particle sensor

Packing


390.0±5.0
24.0±2.0
20.0
48.0±2.0
5.0



T=8 layers



Qty per layer	Layer	Carton	Carton dimensions	Packing material
50pcs	8layers	400pcs	W395 * L310 * H330 mm	Red pearl cotton

User attention

※ Ensure the ventilation of air inlet and air outlet in installation;

※ The sensor should not be used in the environment with organic gas and flammable gas. If there is dust in the chamber of the sensor, please clean with cleaner;

※ The product should be kept away from high frequency and high voltage source to avoid the interference caused by high frequency and high pressure. The measurement error of the sensor would be increased by the external light affection. Therefore, the external light should be avoided when installation;

※ The measurement error of the sensor would be increased by the irregular strenuous vibration.

After-sales services and consultancy

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