

# SPECIFICATION

**Product Name: LED Particle Sensor**

**Item: PM1006**

**Version: V0.1**

**Date: 2018-3-6**

<b>Writer</b>	<b>Audit</b>	<b>Approved</b>
<b>May Yang</b>		

# Revision

No.	Version	Content	Reviser	Date

# Infrared LED Particle Sensor PM1006



## Introduction

Infrared LED particle sensor module PM1006 adopts the principle of optical scattering to detect the variation trend of particle (size between 0.3 $\mu\text{m}$  to 10 $\mu\text{m}$ ) concentration in the air. There is an infrared light-emitting diode and an optoelectronic sensor built-in PM1006, 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

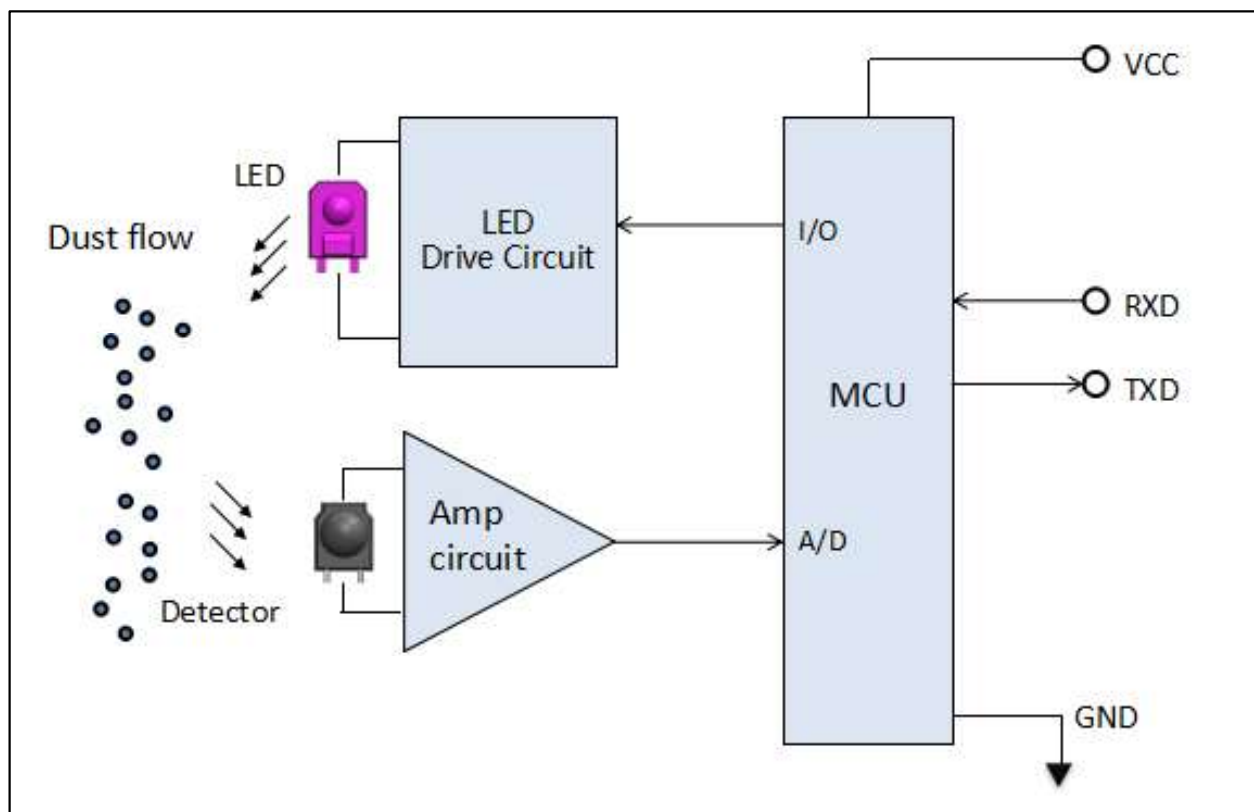
- ✧ Integrate MCU, directly output particle mass concentration ( $\mu\text{g}/\text{m}^3$ )
- ✧ Integrated temperature sensor, temperature compensation within the whole temperature range

**Table 1. Specification**

### LED particle sensor specification

<b>Principle</b>	Light scattering(LED)
<b>Measuring range</b>	0~1000 $\mu\text{g}/\text{m}^3$
<b>Accuracy</b>	$\pm 20\mu\text{g}/\text{m}^3$ or $\pm 20\%$ of reading (@voltage 5.0V, 25 $\pm 2^\circ\text{C}$ , 50% $\pm 10\%$ RH)
<b>Response time</b>	8s
<b>Working condition</b>	-20 $^\circ\text{C}$ ~+75 $^\circ\text{C}$ , 0~95%RH(non-condensing)
<b>Storage condition</b>	-40 $^\circ\text{C}$ ~+85 $^\circ\text{C}$ , 0~ 95%RH(non-condensing)
<b>Working voltage</b>	DC 5V $\pm 0.2\text{V}$ ripple <50mV
<b>Working current</b>	$\leq 30\text{mA}$
<b>Signal output</b>	UART: 4.5V level
<b>Size</b>	W46.2*H34.1*D18 mm
<b>MTTF</b>	$\geq 5$ year

## Internal architecture and principle description



**Fig 1** Internal architecture

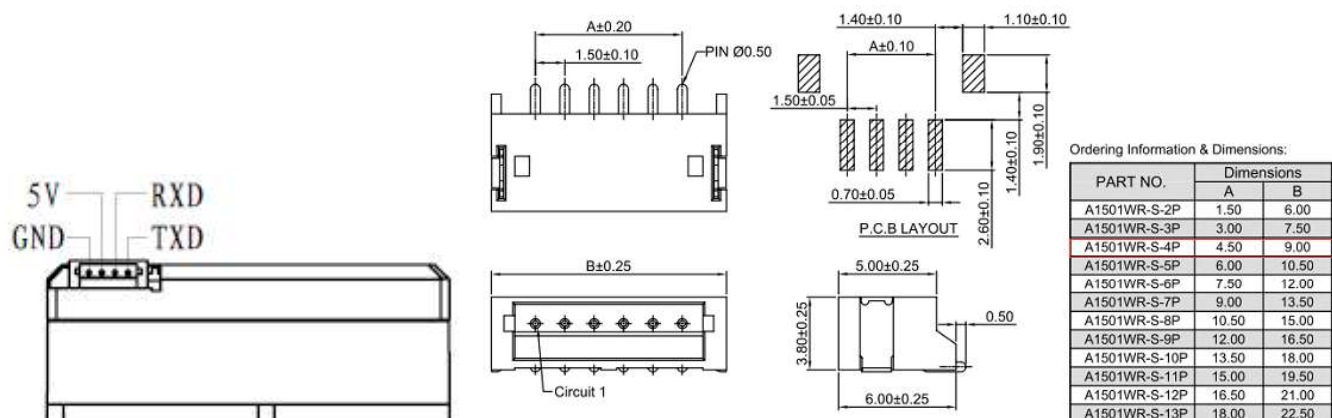
### Light scattering principle

According to the above picture, the light source of PM1006 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 PM1006

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



**Fig 2** Connector Dimensions

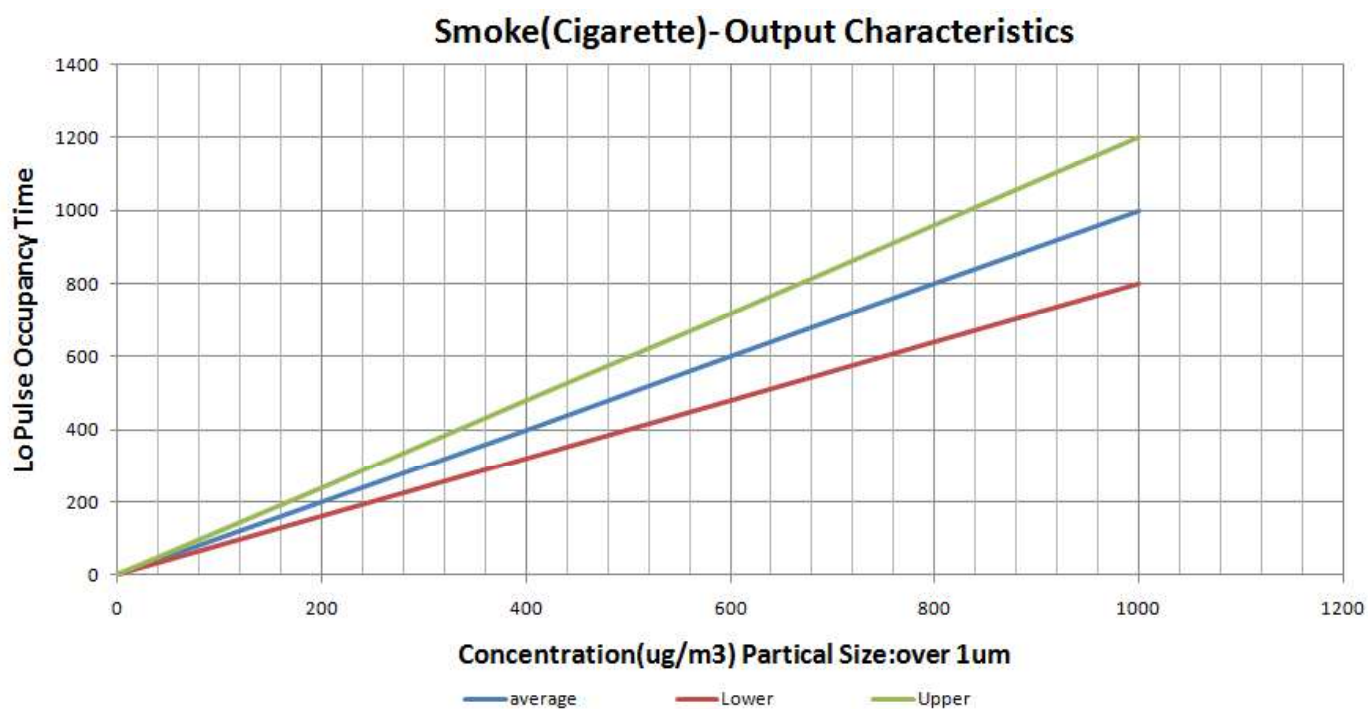
**Table 2.** I/O definitions

NO.	Pin	Description
1	GND	Power input (ground terminal)
2	VCC	Power input(+5V)
3	RXD	UART receiving (TTL level @4.5V)
4	TXD	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  $25 \pm 2 \text{ }^\circ\text{C}$

The humidity of the environment is  $50 \pm 10\% \text{RH}$

Cigarette smoke: Hong Ta Shan 8mg

## Communication protocol

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### ◆UART communication:

#### UART level range

-UART RX: 0~4.5V data input

-UART TX: 0~4.5V data output

#### UART configuration

-data bit: 8

-Stop bit: 1

-Check bit: non

-Baud rate: 9600bps

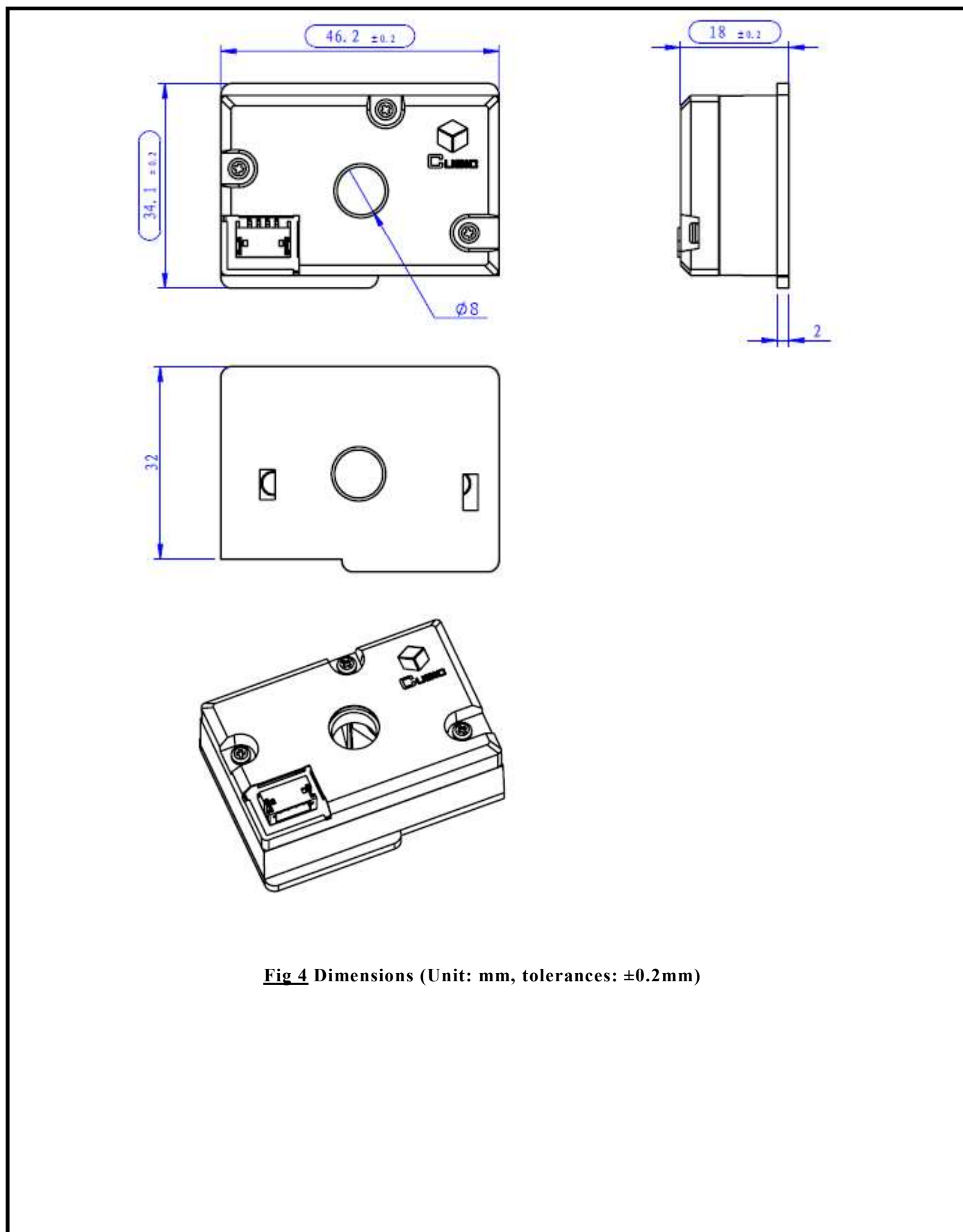
#### Read measures result of particles:

**Send:** 11 02 0B 01 E1

**Response:** 16 11 0B DF1-DF4 DF5-DF8 DF9-DF12 DF13 DF14 DF15 DF16[CS]

**Note:**  $PM_{2.5}(\mu g/m^3) = DF3 * 256 + DF4$

## Dimensions

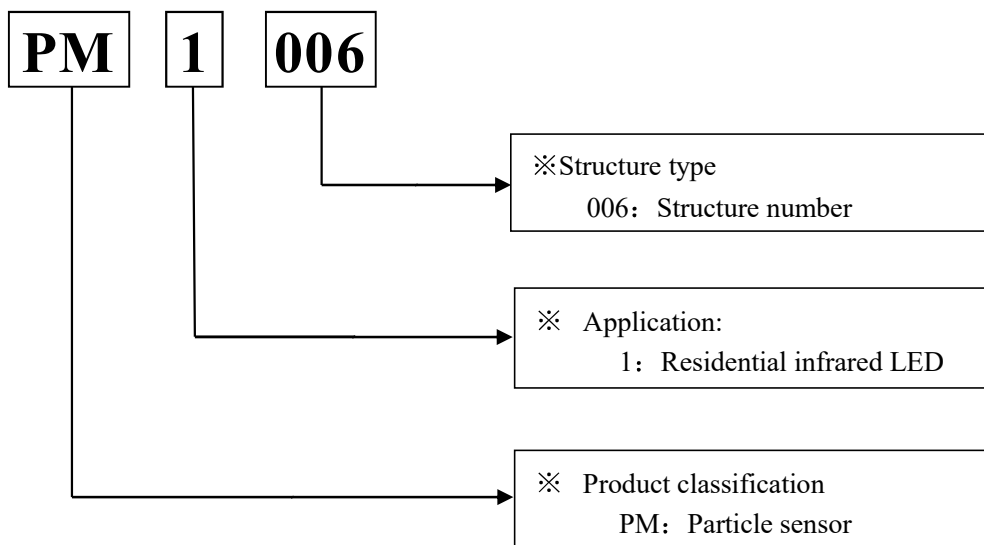


**Fig 4 Dimensions (Unit: mm, tolerances:  $\pm 0.2$ mm)**

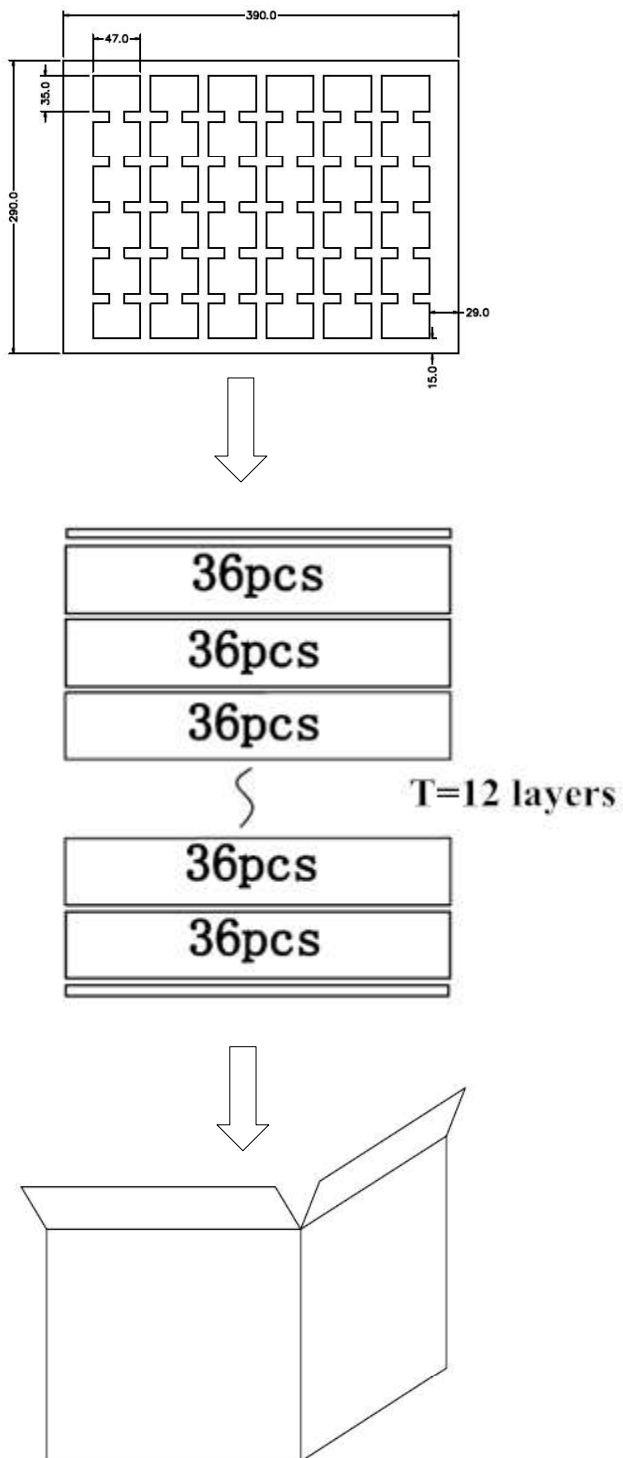


## Ordering information

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# Packing



Qty per layer	Layer	Carton	Carton dimensions	Packing material
36pcs	12layers	432pcs	W400 * L300 * H320 mm	Red pearl cotton

## User attention

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- ※ 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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