HENAN FOSEN ELECTRONICS TECHNOLOGY CO., LTD.

SPECIFICATION FOR APPROVAL

LASER DUST SENSOR
MODEL : FS00202

Customer	**XXXXXXXX**
Product Name	LASER DUST SENSOR
Model	FS00202
Specification Version	2016-11-08
Specification Status	☐ Sample ☐ Mass Production
Sample specification	Apply to short run production
The specification for mass production	Apply to mass production

Customer Approval		**Supplier**		
Approval	**Date**	**Check**	**Prepare**	**Data**

Note: No prior notice will be given for any change on targeted improvement as if it does not affect the performance of product .Any objection shall be submitted to us once available.

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1. Product description

With regard to model no FS00202 of laser dust sensor, a digital sensor from general purpose that calculate the concentration of particulate matter. It used to get the quality and quantity of suspended particulate matter per volume, that of the concentration of particulate matter (Unit:μg/m3)、Digital interfaces is the most common form for output data.

This sensor will be compatible with existing instrument or environmental improvement equipment which is related to the concentration of airborne particles and providing the accurate data in time.

The working principle of sensor is utilizing laser scattering which induced it into the air , thus making particulate matter to scatter. At the same moment, any scattered light from specified point will be collected then formulating a curve with the development of time. Therefore, the microprocessor can get both equivalent particle diameter and the total amount of particle per volume, on the basis of MIE (theoretical algorithm)

2. The characteristic of sensor

- Comprehensive shielded design, strong anti-interference ability, both the inlet and outlet are set at the same side. Customer do not require operation for air duct.
- The minimum size of resolvable particle is 0.3μm
- Ultra-thin material and super silent
- Zero false alarm
- Real-time response
- Accurate data
- Long life

3. Main application

- Air Quality monitors, portable instrument, air cleaner
- Fresh air ventilator, air conditioning, equipment for smart home
- Hospital, hotel and school and locus public

4. Technique index

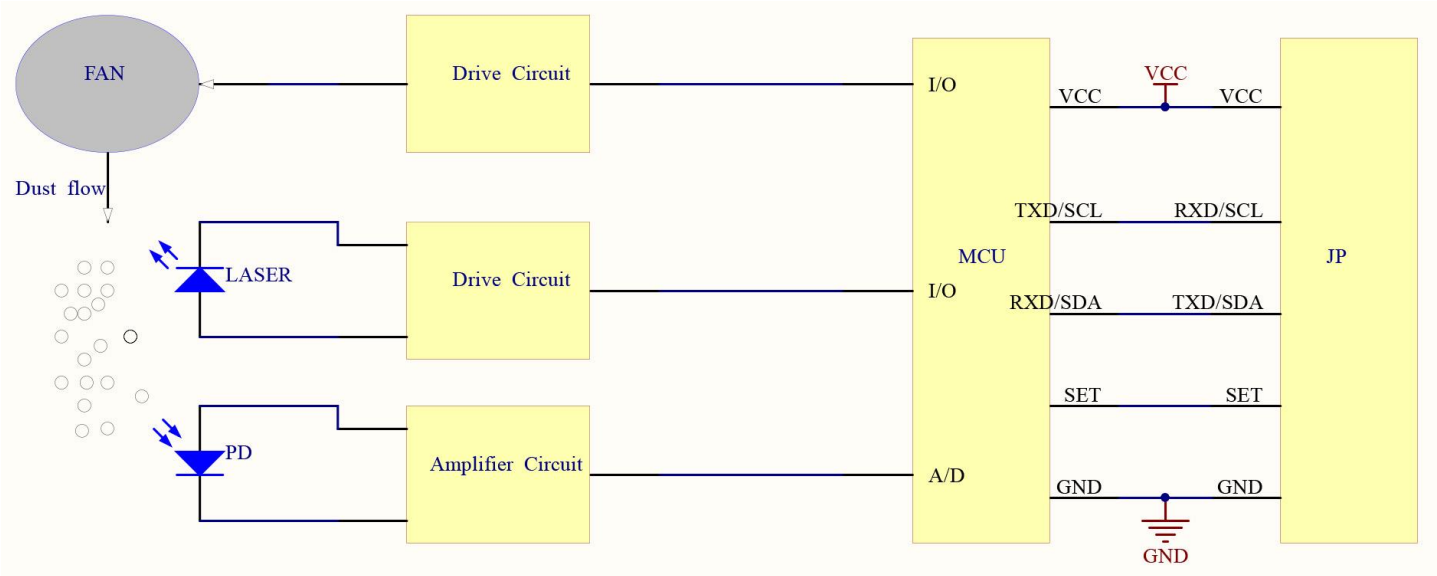
Parameter	Index	Unit
Particle size range	0.3~10	μm
Output result	Particle mass concentration	μg /m³
Measurement range	PM1.0: 0 ~ 1,000μg/m³ PM2.5: 0 ~ 1,000μg/m³ PM10: 0 ~ 1,000μg/m³	
Effective range	PM1.0: 0 ~ 1000μg/m³ PM2.5: 0 ~ 1000μg/m³ PM10: 0 ~ 1000μg/m³	
Resolution	1	μg/m³
Maximum consistency error for PM1.0&PM2.5&PM10	0 ~ 100μg/m³, ±10μg/m³ 101 ~ 1,000μg/m³, ±10% reading	
Response time	≤10	S
Working temperature	-10 ~ 50	℃
Working humidity	0~95%RH（non-condensing）	
Storage temperature	-30 ~ 60	℃
Power supply	DC 5V±0.1V，ripple wave＜50mV	
Working current	≤100	mA
Standby current	≤200	μA
Digital output 1（default）	I²C, UART_TTL(L<0.8V@3.3V;H>2.7V@3.3V)	
Digital output 2	DAC(customized)	
Digital output 3	PWM(customized)	
Output method	Default by passive output after powering on, sampling time interval should be over 1,000ms.	
MTTF	＞40000 (continuous turn on)	hr
Maximum dimension	48×37×12	mm

Table1

5. Output data

The primary output data shows the quality and quantity of each suspended particulate matter per volume.
The unit volume is 0.1litre

6. Internal architecture description

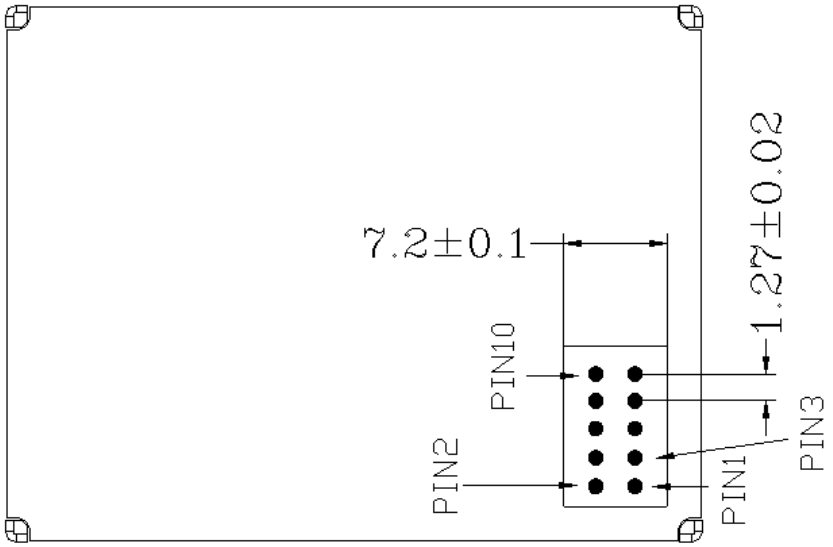


Picture 1. Internal configuration

According to above Block Diagram, the light source of FS00202 is consist of fan for particle sampling, laser diode for particle detection, photodiode for scattered laser signal, Amp for signal amplification the detecting part is consist of light sensitive part which receives reflected light and amplifying circuit. Value and communication output is finished by MPU.

When heating resistor heats, and after showing vertical draft, particles will pass the detecting chamber. The light from laser diode will be scattered by particles and will be tell out by light sensitive equipment, then convert into electronic signal. Electronic signal is disposed by filter circuit and MCU, it will convert into PWM signal output.

7. Pin name



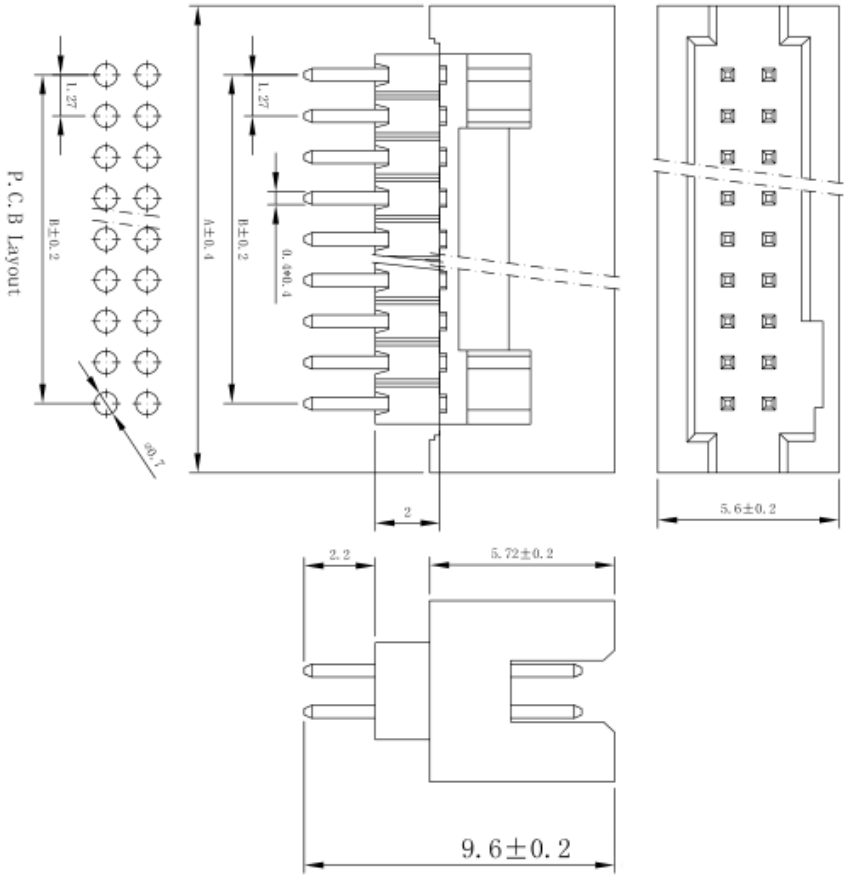
Picture 2 Pin definitions of digital interfaces

Table2

PIN1	VCC	Power input (+5V)
PIN2	VCC	Power input (+5V)
PIN3	GND	Power input (ground terminal)
PIN4	GND	Power input (ground terminal)
PIN5	RESET	Module reset signal (TTL level @3.3V，Low level signal)
PIN6	DAC	Customized
PIN7	RXD/SDA	UART-RX / I²C SDA（TTL level @3.3V）compatible with 5V communication
PIN8	PWM	Customized
PIN9	TXD/SCL	UART-TX / I²C SCL（TTL level @3.3V）compatible with 5V communication
PIN10	SET	Set（TTL level @3.3V/5V，high level or suspending is normal working status, while low level is sleeping mode.

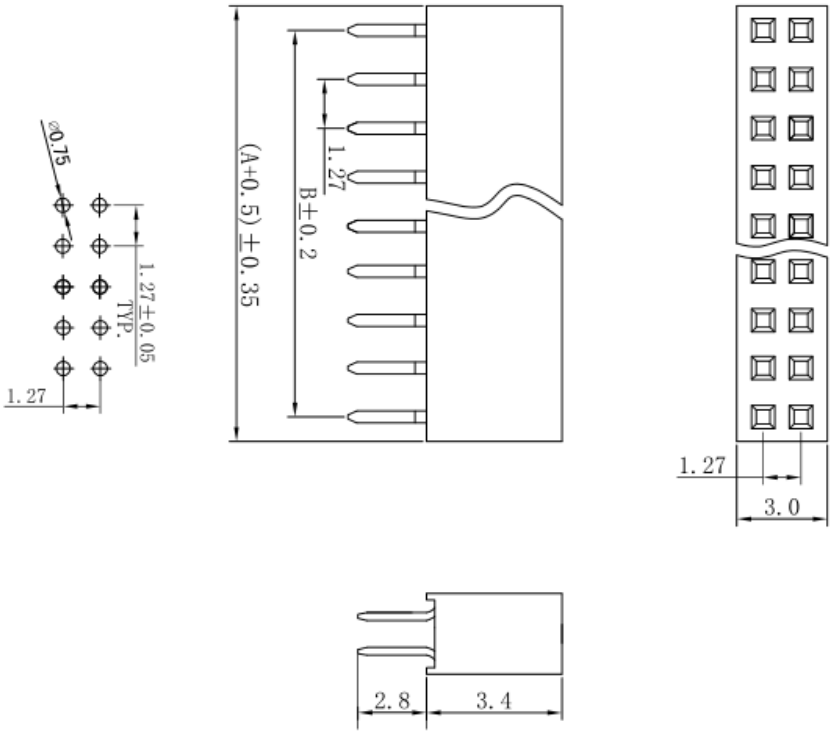
Note: SET=1 refers to adaptive sampling method based on module operation, the response time shall less than 500ms. The updated time should under1s.SET=0 refers to the module enters in standby mode.

The part name of the PIN foot is Jane Cattle, as shown in the figure below:

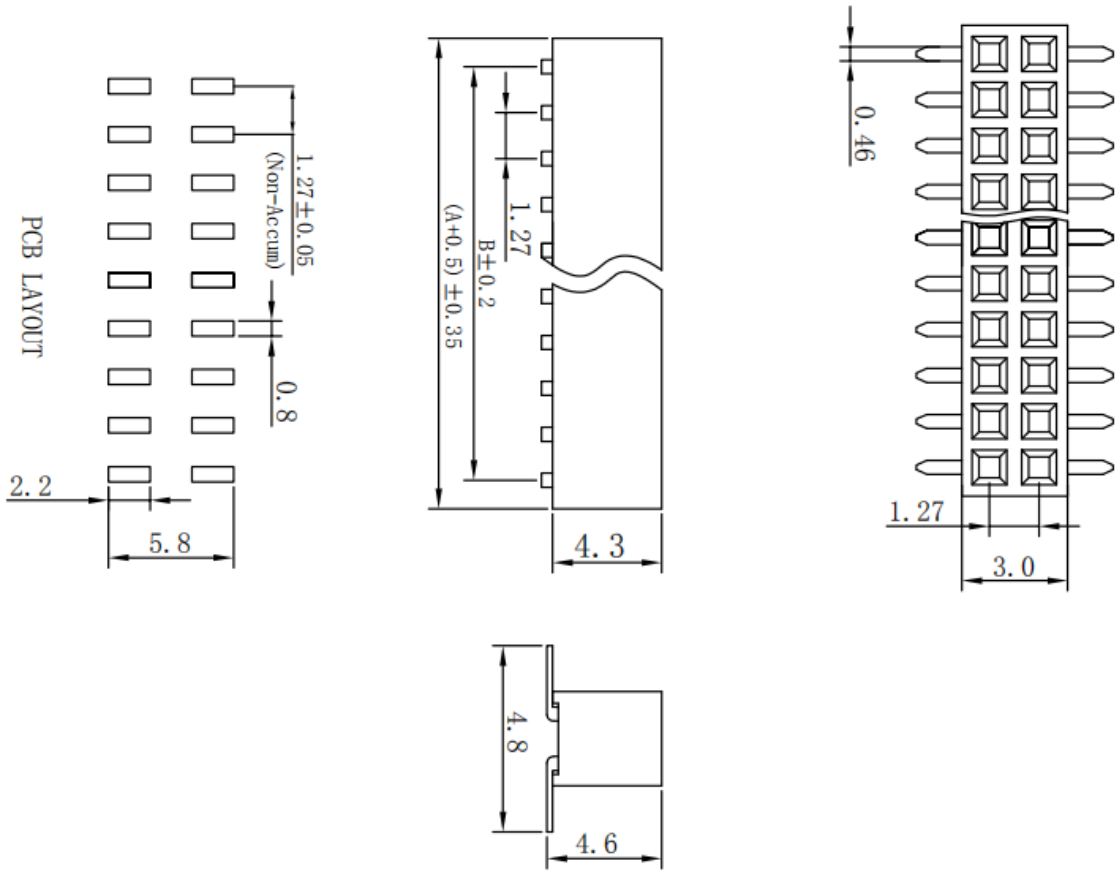


Picture3 Diagrammatic sketch of Jane cattle

The steak mothers are divided into plug-in type and SMT type corresponding to Jane Cattle, as shown in the figure below:



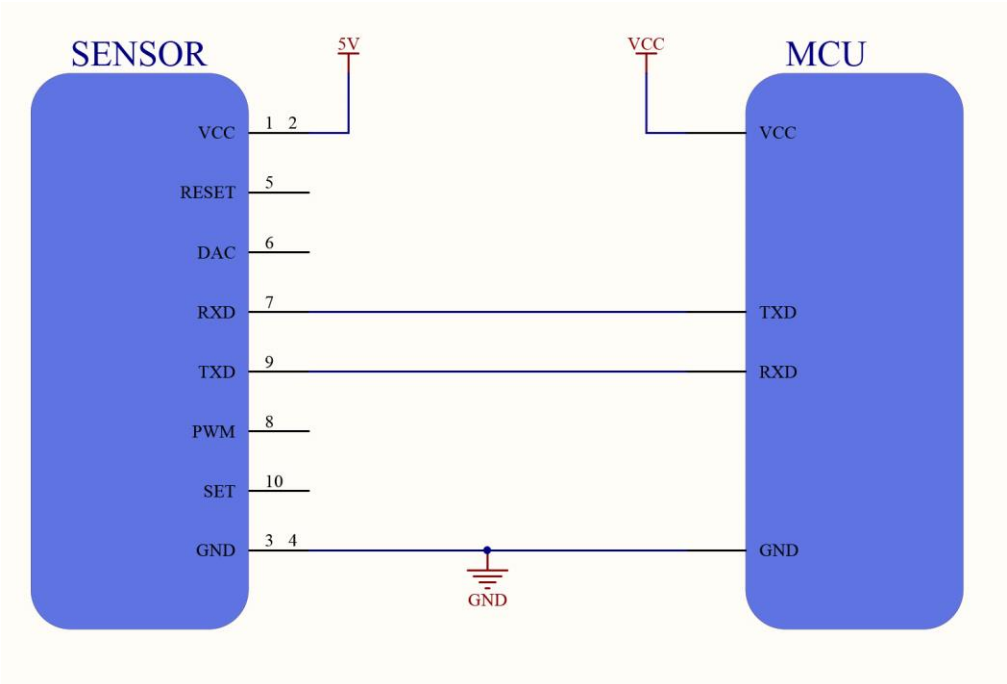
Picture4 Diagrammatic sketch of mother seat (Plug-in)



Picture 5 Diagrammatic sketch of mother seat (SMT)

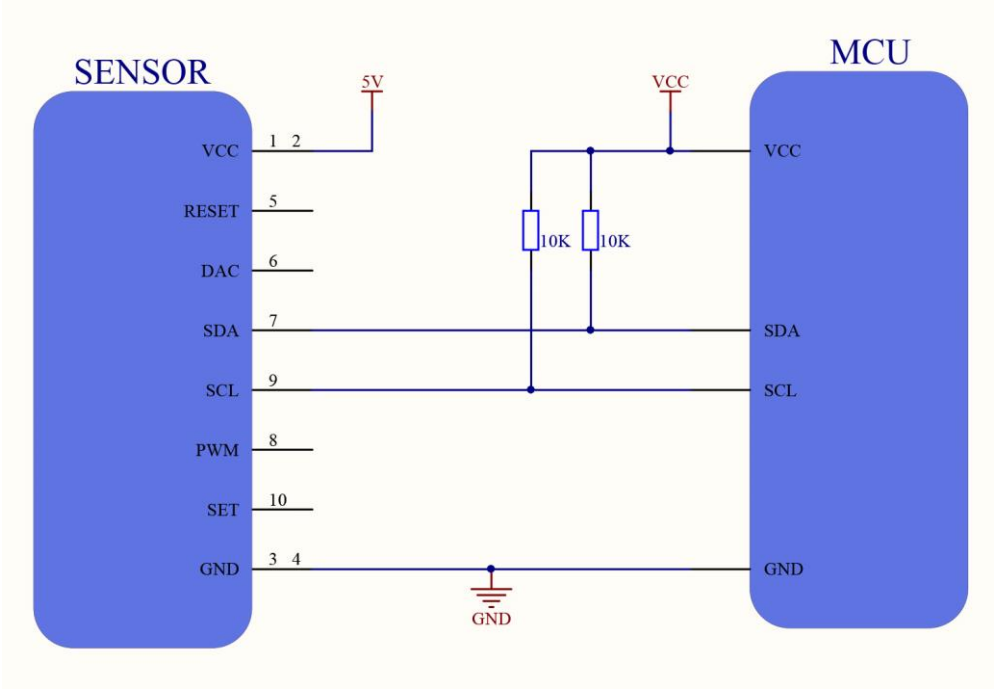
8. Typical application circuit

Case 1. UART application



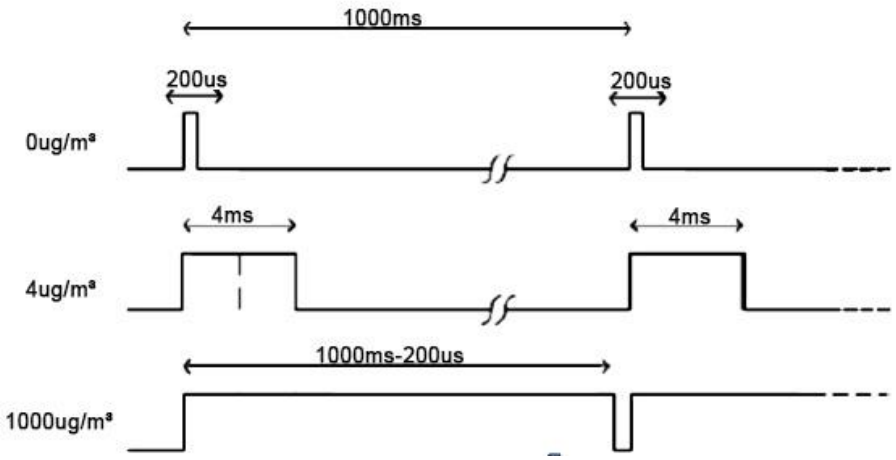
Picture 6

Case 2. I²C application



Picture 7

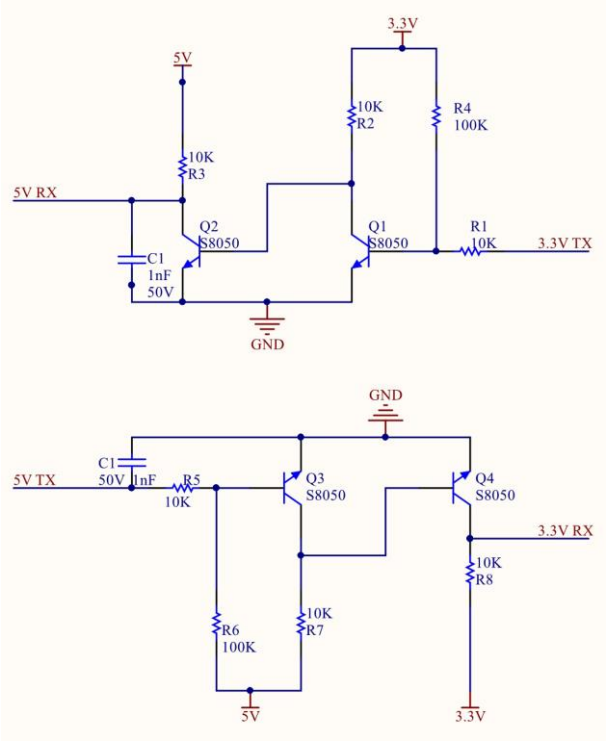
Case 3. PWM application



Picture 8

Note of circuit design ：

※ The supply source of FS00202 should be 5V， since fan should be driven by 5V supply. The other data communication and controlled pin need 3.3V as high level. So, the main board MCU which communicate with sensor should be 3.3 communication level. If main board MCU is 5V communication level, then should add an external 5V switch to 3.3V level on the communication pin (RX, TX) and controlled pin (RESET), to switch components and circuit.



Picture 9

※ UART communication is compatibility with 3.3V and 5V level.

※ There is pull-up resistor inside the SET and RESET. No matter there is signal input or not, these two pins will work normally. If they are not useful for you, keep it hung.

9. Temperature influence curve

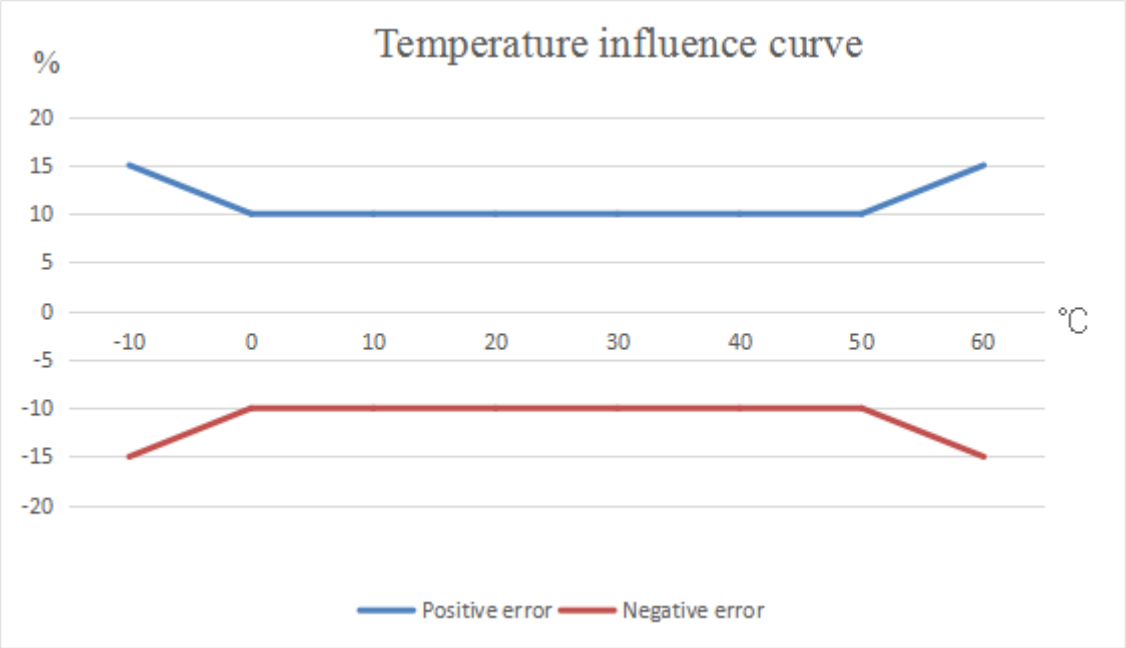


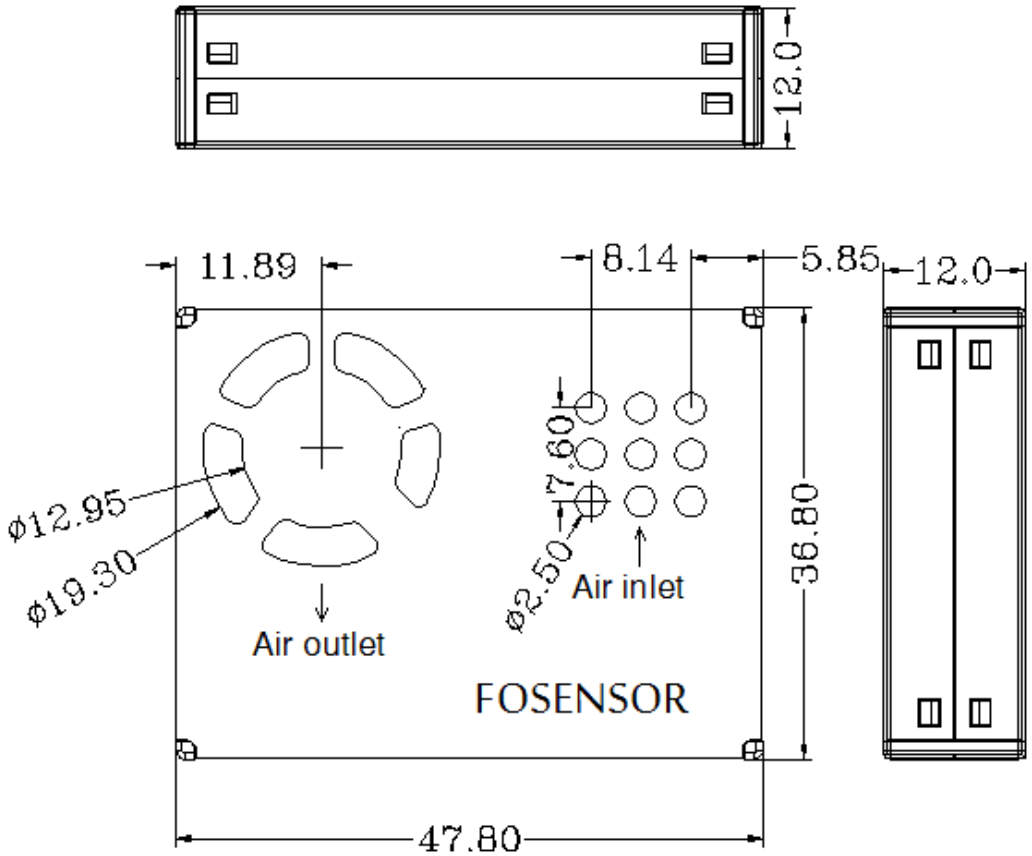
Figure 1

10. Reliability test on sensor

Test Item	Test Condition	Standard	Sample qty : N Defective qty : C
low temperature storage	Measuring error of sensor placed in normal temperature environment after storage for 72 hours without electricity at - 30 ±2℃.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
High temperature storage	Measuring error of sensor placed in normal temperature environment after storage for 72 hours without electricity at 60 ±2℃.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
Low temperature work	The sensor is placed in a low temperature environment of - 10 ±2℃, applied rated voltage, operated for 72 hours, and then put it in a normal temperature environment to measure the measurement error of the sensor.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
High temperature work	The sensor is placed in a high temperature environment of 50 ±2℃, applied rated voltage, operated for 72 hours, and then put it in a normal temperature environment to measure the measurement error of the sensor.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
High and low temperature impact	After holding 60 minutes at -30℃, switch to 60℃ in 10s and maintain 60 minutes as a cycle. There are 10 cycles. The sample will not be powered up during the test period.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
High temperature and high humidity operation	Operating the sensor in the ambient of 45±2℃, 90 ±5%RH, max voltage (within range of acceptable working voltage), for 72 hours.	The sensor works normally after 2 hours in the ambient.	N=5 C=0
Salt spray test	According to GB/T2423.17, place in the salt spray box with a temperature of 35 ℃, spray with a concentration of 5% Sodium Chloride Solution for 24 hours. After the experiment, wash it with distilled water and blow dry with air.	Under the standard environment, the recovery should be no less than 1h and no more than 2H. The appearance should be free from bad and corrosion.	N=2 C=0
Vibration	Bare machine should be able to withstand vibration test under the age specified in X/Y/Z axis： Frequency range：10~55~10Hz/min； Amplitude：1.5mm； Scanning cycle：2H	After the test, the appearance should be no bad. The sensors meet the basic performance test standard.	N=4 C=0
Packing fall	Drop height：Set the height according to the height of weight specified by GB/T4857.18. Test according to the dropping test method of GB/T4857.5 package transportation package. The sequence of drop test is one corner, three edges and six sides.	After packaging drop test, the sensor should have no bad appearance, no component falling off, and the sensor should work normally.	N=1 box C=0

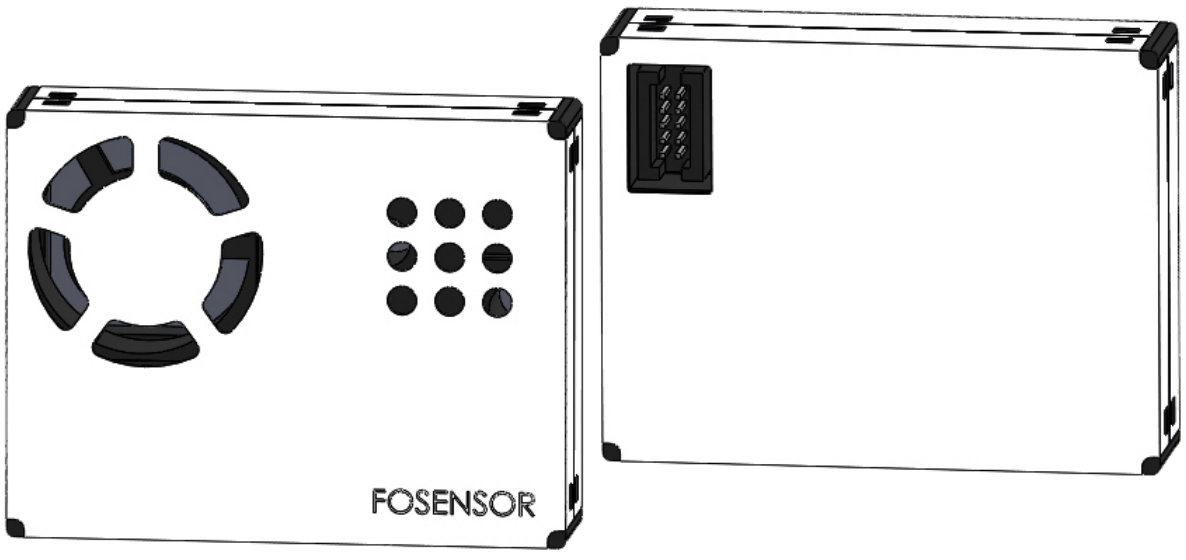
Table3

11. External dimension



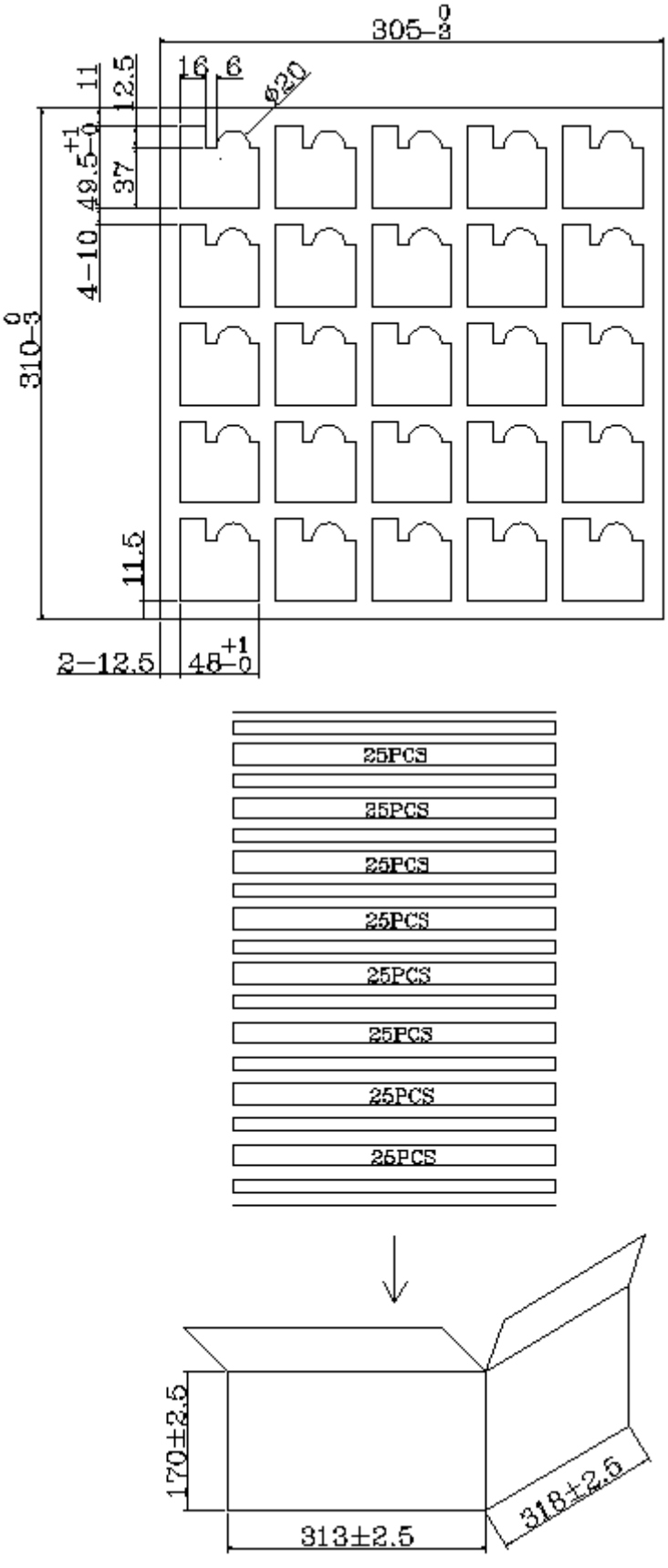
Picture 10：Appearance size（Unit mm，Error ±0.2mm）

3D Drawings



Picture 11

12. Packing scheme

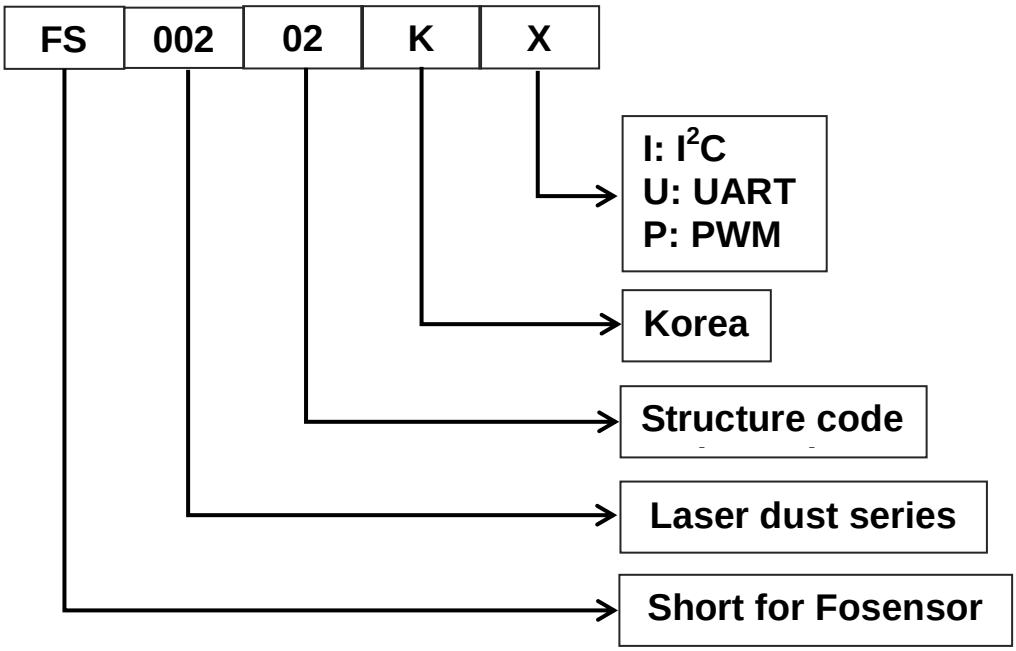


Picture 12

Table4. Packing description

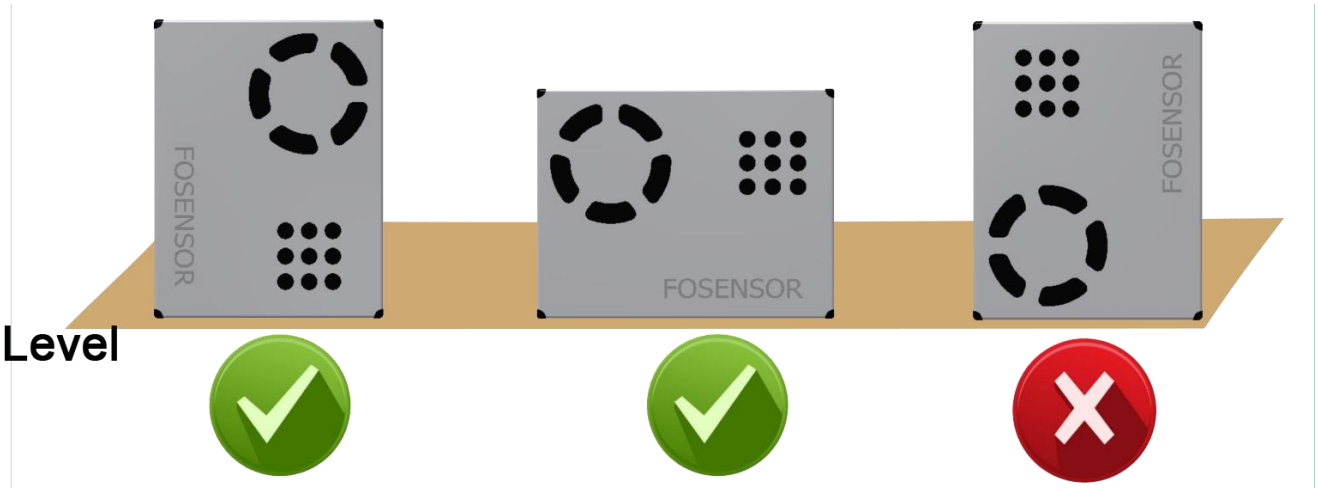
Qty per layer	Layer	Carton	Carton dimensions	Single box net weight	Single box gross weight	Packing material
25pcs	8layers	200pcs	W318*L313*H170mm	5.17kg	7kg	Red pearl cotton(EPE)

13. Model naming rules



14. Cautions

- The sensor must be installed vertically, ensuring both the inlet and outlet keep unobstructed,avoiding strong airflow as well.
- Keep away from artificial airflow for example fan. Neither the front nor rear of fan can be installed an air cleaner.Leave a vent open to let air flowing.
- Keep viscous particles, such as oil, away from entering the sensor in the process of installation, which may cause trouble in stuck to optical components.
- Keep from moisture or it will break down.
- Keep from outdoor operation or in dusty environments.
- The metal part of the shell of the product connect with the internal circuit board directly. If people touch the DC of the whole machine directly, there will be a safety problem. Therefore the sensor needs to be installed in the position where the human body cannot touch it easily. People can only touch it after the power off.
- A/S available only if purchased from Fosensor Korea.
- Correct installation position as below for reference:



Picture 13

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