ASAIR®

Volatile Organic Compounds Senser

AGS01DB User Manual

Date	Version	Record
11/2018	V1.0	First edition

1. AGS01DB Dimensions

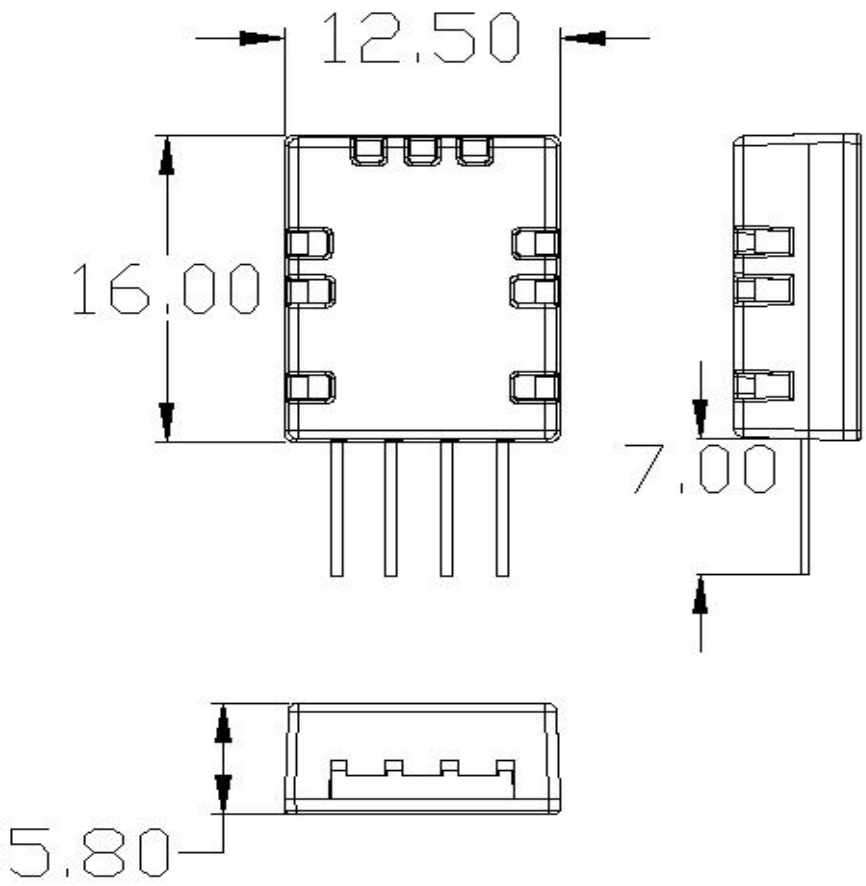


Figure 1 Dimension (Units: mm)

2. Product parameters

2.1 Electrical characteristics

1.Electrical characteristics

Module	AGS01DB
Supply Voltage	3.3-5.5V DC
Minimum power supply current	24mA
Typical power supply current	26mA
Maximum power supply current	30mA
Typical output power (3.3V power supply)	86mW
Typical output power (5V power supply)	130mW

Sampling period	>=2second/time
Output signal	IIC slave mode
Preheating time	120second
working temperature	0℃～50℃
Working humidity	0～95%RH
Packing	4PIN
Weight	1g
lifetime	>5year

2.Senser characteristics

Sensor category	MEMS semiconductor metal oxide sensor
Output unit	PPM
measuring range	0-100PPM
resolution ratio	0.1PPM
measurement accuracy	20%（F.S）
Standard test gas	ethanol

3. Pin Definitions

3.1 Pin Assignment

Pin-No	Name	Description
1	VDD	Power Supply (3.3V-5.5V)
2	SDA	Serial data, two-way port
3	GND	Ground supply
4	SCL	Serial clock input (single ground bus)

3.2 Power Pin（VDD GND）

Supply voltage is from 3.3V to 5.5V.

3.3 Serial Data Pin（SDA）

The SDA pin is a three state structure for reading and writing sensor data. Specific communication timing, see the detailed description of the communication mode.

3.4 Serial Data Pin（SCL）

The SCL pin must be kept high after power on,until the IIC communication is started, otherwise the IIC communication will be bad. The SCL pin is used for the sensor communication clock line. When I2C communicates, SCL is used for communication synchronization between microprocessors and AGS01DB.

4. IIC and single bus communication protocol

The serial interface of AGS01DB has been optimized in terms of sensor signal reading and power loss. The sensor is output by I2C communication mode. I2C communication is addressed in accordance with I2C standard protocol and can be directly linked to the I2C bus (only one product is allowed on the bus), without additional wiring and easy operation. When reading the AGS01DB sensor, please proceed in strict accordance with the I2C communication protocol in a timely manner. The detailed communication protocol is detailed in the I2C communication protocol.

4.1 AGS01DB sensor I2C communication protocol

AGS01DB supports the I2C mode to communicate, which is designed in accordance with the I2C standard protocol and can be directly attached to the I2C bus; the sensor SDA pins are connected to the I2C data bus, and SCL connects to the I2C clock bus, and the customer needs to connect the two pins to a pull-up resistance of the 1K Omega ~10K Omega. The I2C address is 0x22 (DEV SEL); the I2C communication rate can not be higher than 400KHZ.

Communication protocol:

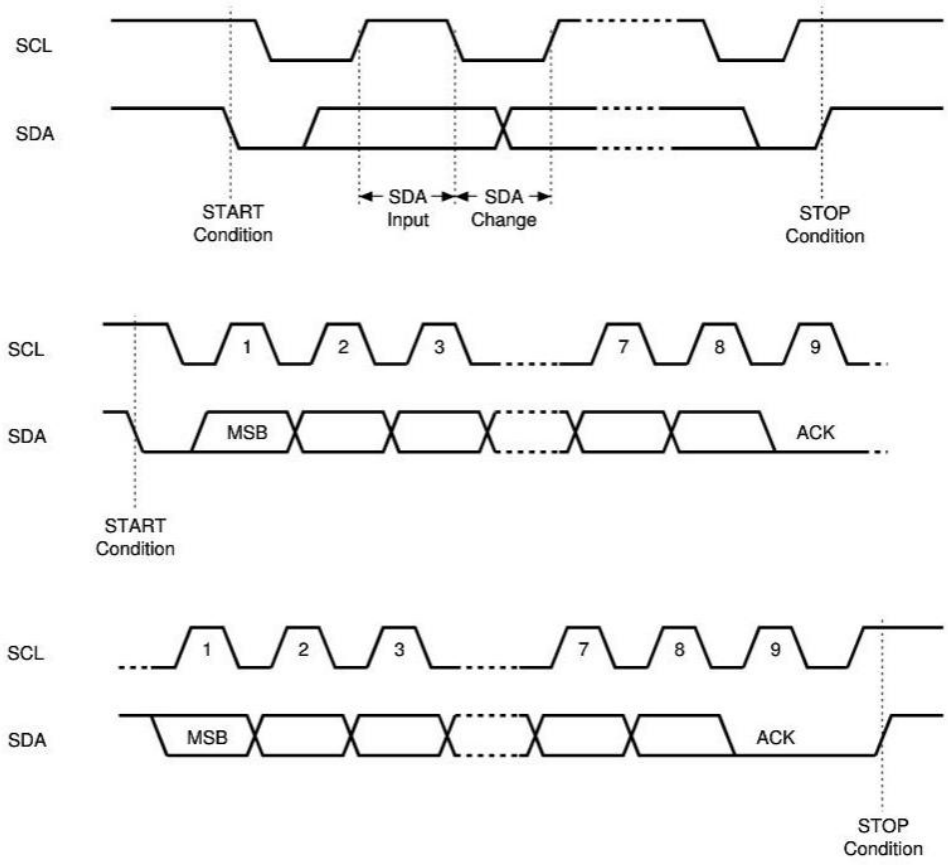
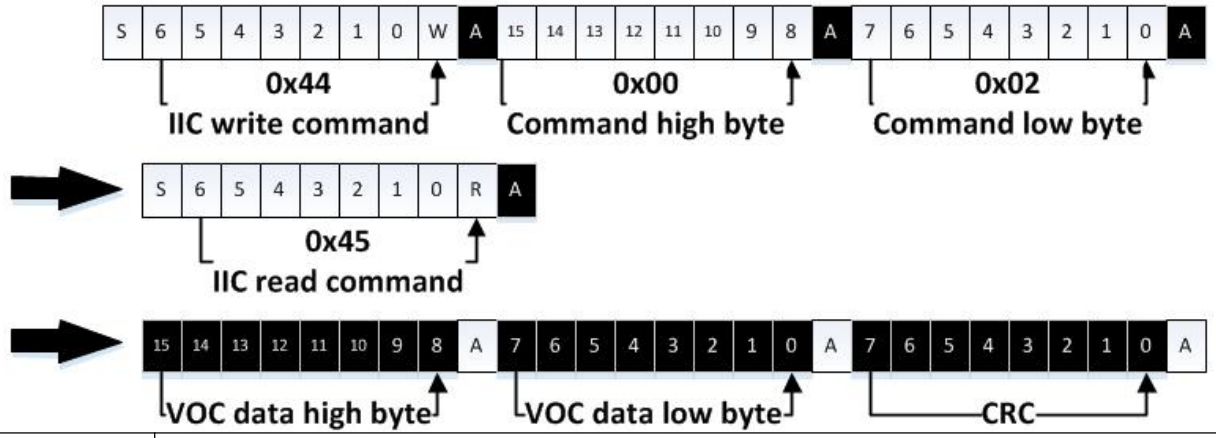


Figure 2 IIC communication protocol

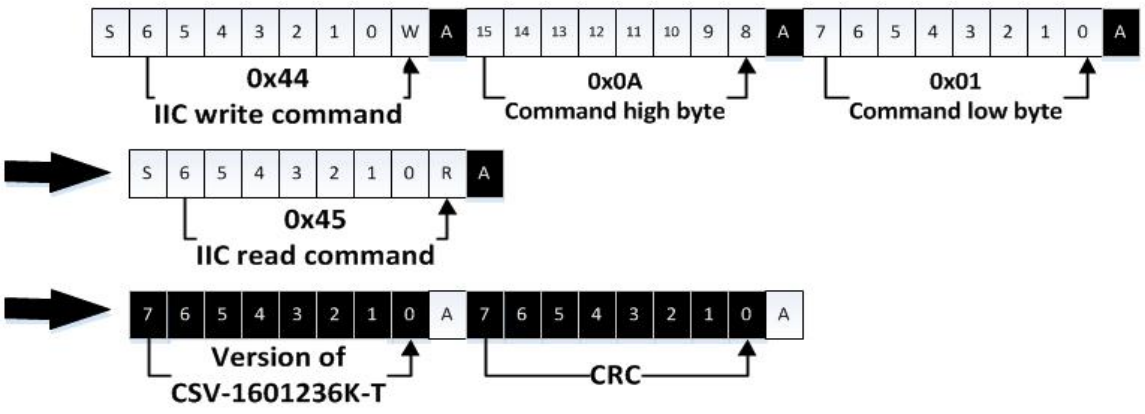
4.2 Data acquisition of AGS01DB sensor

The AGS01DB sensor module data acquisition instruction is defined as follows.

Command	Condition	Hex. CODE	Location
VOC DATA	command high	0x00	Bit15:8
	command low	0x02	Bit7:0
			
Return data	VOC data high byte+VOC data lowbyte+CRC		
Return data processing	For example: VOC data high byte =0x02, VOC data low byte=0x0B, CRC=0XB2. The data collected by AGS01DB is 0X020B (hex.code) and converted to decimal number is 523. Because the resolution ratio of the sensor is 0.1PPM, the concentration of VOC gas collected by AGS01DB is 523/10=52.3PPM.		

4.3 Version acquisition of AGS01DB sensor

The AGS01DB sensor version number read instruction is defined as follows.

Command	Condition	Hex. CODE	Location
Version Num	command high	0x0A	Bit15:8
	command low	0x01	Bit7:0
			
Return data	Version of AGS01DB +CRC		
Return data processing	For example: sensor version number =0x0B, CRC=0X46; The version of AGS01DB is 0X0B;		

4.4 Checksum Calculation

The AGS01DB sensor CRC is tested using CRC8, the initial value is 0XFF, and the polynomial is 0x31 (x8 + X5 + X4 + 1). See the code below.

```
//**********************************************************************
//function name: Calc_CRC8
//function: CRC8 calculation, initial value: 0xFF, polynomial: 0x31 (x8 + X5 + X4 +1)
//parameter: U8 *data:CRC test the first number; U8 Num:CRC test data length.
//return: CRC: the calculated value of the CRC8
//**********************************************************************
u8 Calc_CRC8(u8 *data, u8 Num)
{
    u8 bit,byte,crc=0xFF;
  for(byte=0; byte<Num; byte++)
  {
    crc^=(data[byte]);
    for(bit=8;bit>0;--bit)
    {
      if(crc&0x80) crc=(crc<<1)^0x31;
      else crc=(crc<<1);
    }
  }
    return crc;
}
```

4.5 Typical circuit

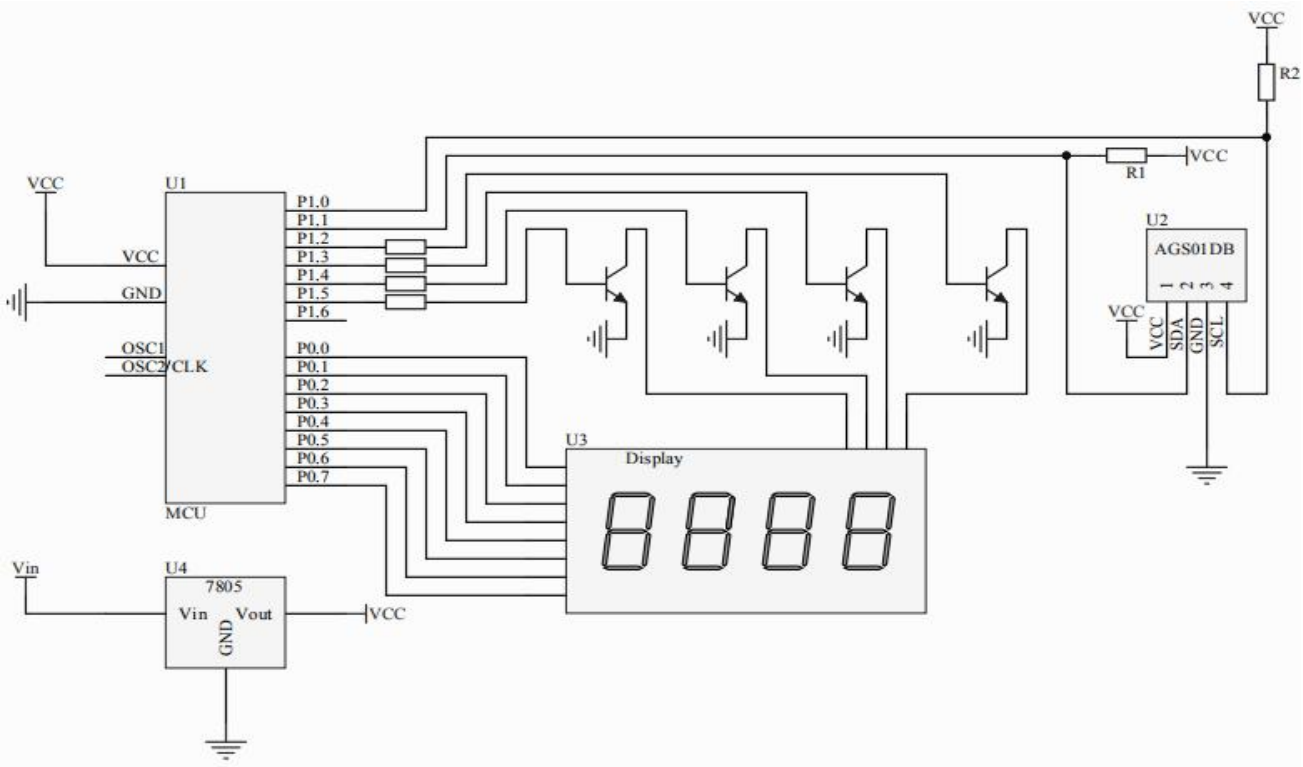


Figure 5 Typical circuit diagram

A typical application circuit for connecting microprocessors to AGS01DB is shown in the above diagram. SDA is connected to the I/O port of the microprocessor after pull-up.

1. It is recommended to use 4.7K pull-up resistor in typical application circuit.

2. The VOC value of each read is the result of the last measurement. In order to obtain real-time data, it needs to read two times continuously, and the accurate data can be obtained each time the interval of the sensor is equal to or greater than 2 seconds.

5. Attention and application information

5.1 water environment

5.1.1 The AGS01DB sensor splashes water or soaked into the water, which will cause the sensitivity of the sensor to decrease, and even the damage of the sensor which can not be worked out.

5.1.2 Under the conditions of indoor use, slight condensate will affect the performance of the sensor to a certain extent. Therefore, if the water condenses on the surface of the sensitive layer and remains for a period of time, the characteristics of the sensor will decrease.

5.1.3 The freezing of water on the surface of the sensor leads to the loss of sensitive properties of the material layer of the sensor.

5.2 High concentration gas

5.2.1 Whether or not the sensor is energized and placed in a high concentration gas for a long time will affect the characteristics of the sensor. If we use a lighter gas to spray directly into the sensor, it will cause great damage to the sensor, or it will cause serious damage to sensors by placing sensors in high concentrations of methane, ethylene, hydrogen, propane and other gases.

5.2.2 To avoid the measurement of a sensor where the gas flow is large, such as a vent or a fan against the blow, which will result in an inaccurate measurement.

5.3 High voltage and polarity reversal

5.3.1 When the voltage of the sensor module is too high, for example, the applied voltage is more than 6V, it will directly cause the damage of the sensor module which is not recoverable.

5.3.2 When the positive and negative polarity of the sensor is inverse, it can also cause the damage of the sensor circuit. Thus, the sensor module is not working.

5.4 Alkaline, acid environment and halogen pollution

5.4.1 When the sensor is contaminated by alkaline or acidic liquid spray, or exposed to halogen like freon, it can also cause deterioration in performance. The data is incorrect.

5.4.2 When exposed to high concentrations of corrosive gases (such as H 2 S, SO 2, Cl 2, HCL, etc.), sensors will not only cause corrosion or destruction of sensor circuits and sensors, but also cause irreversible deterioration of sensitive material properties.

5.5 Exposure to vapors of volatile silicon compounds

The sensor should avoid exposure to silicon adhesives, hair adhesives, silicone rubber, putty, or other places with volatile silicon compounds. If the surface of the sensor is adsorbed on silicon compound vapor, the sensitive material of the sensor will be encased by the silicon oxide to form the two silicon oxide package, which will inhibit the sensibility of the sensor and is not recoverable.

5.6 Long-Term Storage

When the sensor is stored for a long time under the condition of power off condition, the resistance will produce a reversible drift, which is related to the storage environment. The sensor should be stored in a sealed bag containing no volatile silicon compounds. Long time storage sensors need more time to be electrified to make it stable before use. The time of storage and the corresponding aging time are recommended as table 《storage and aging》.

Talble4 《Storage and aging》

Storage time	Suggested aging time
Less than 1 weeks	not less than 2 hours
1~6 months	not less than 12 hours
More than 6 months	not less than 24 hours

5.7 Exposure to extremes for a long time

Regardless of whether the sensor is energized or exposed to extreme conditions for a long time, such as high humidity, high temperature or high pollution, the performance of sensor will be seriously affected.

5.8 Vibration

Frequent and excessive vibration can cause resonance and fracture of the inner lead of the sensor.

5.9 Strong impact

If the sensor is strongly impacted or dropped, the component is loosened and the lead is broken.

5.10 weld

5.10.1 Manual welding is the most ideal welding method for the sensor. It is suggested that the welding conditions are as follows:

Scaling powder：The minimum chlorinated rosin flux

Constant temperature soldering iron：

Temperature：less than 300℃

Time：less than 3second

5.10.2 Wave-soldering is prohibited.

5.10.3 It is forbidden to use alcohol, wash water, or other liquids to clean the sensor.

5.11 Wiring precautions

The quality of DATA signal wire will affect the communication distance and quality of communication. It is recommended to use high quality shielding line.

5.12 Product upgrade

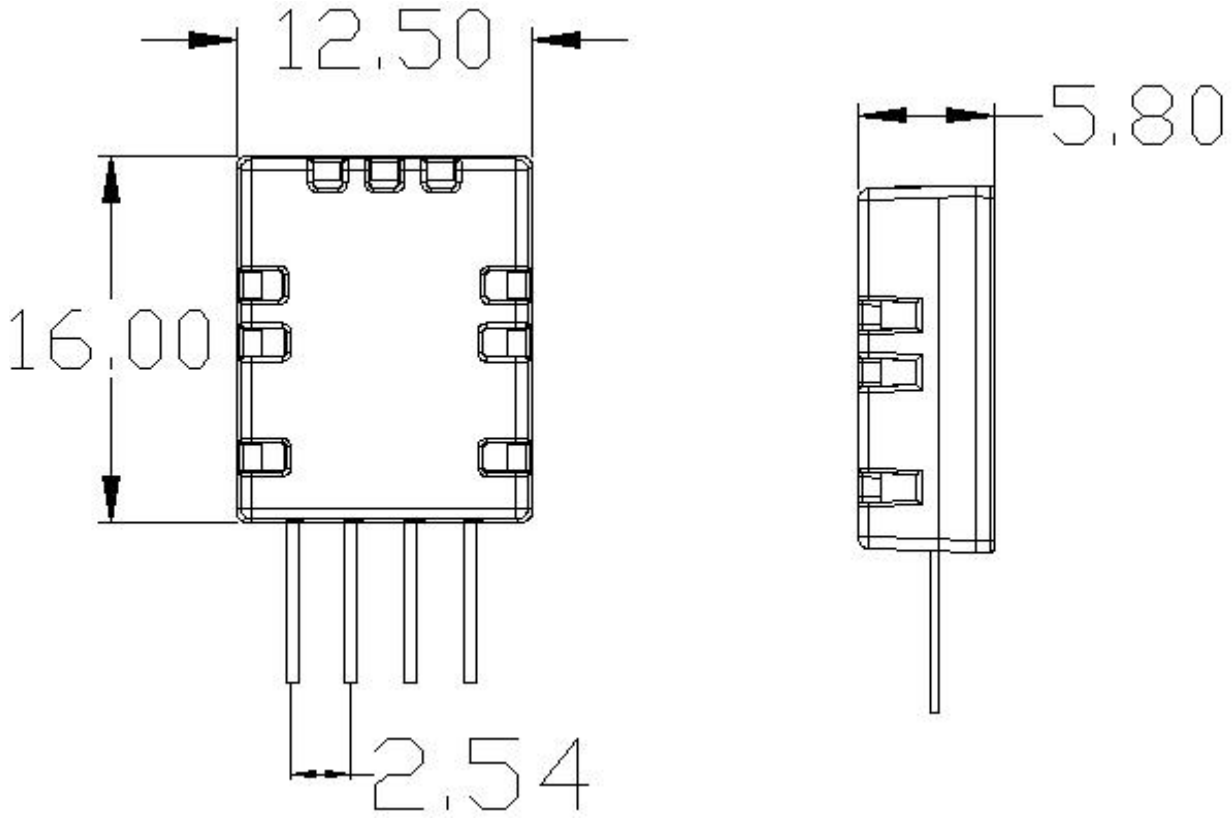
Please consult the technical department of our company.

6. Packing specification

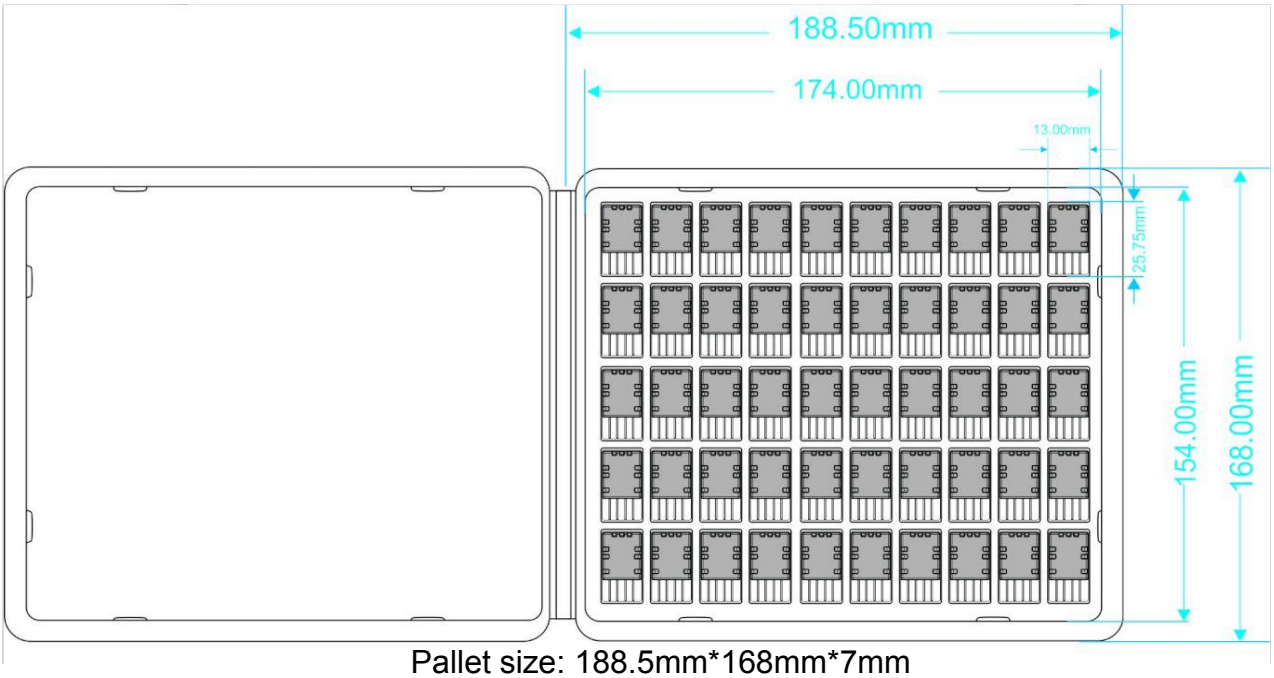
6.1 Each plastic tray packaging 50 sensors.

6.2 Each electrostatic shield contains two plastic pallets.

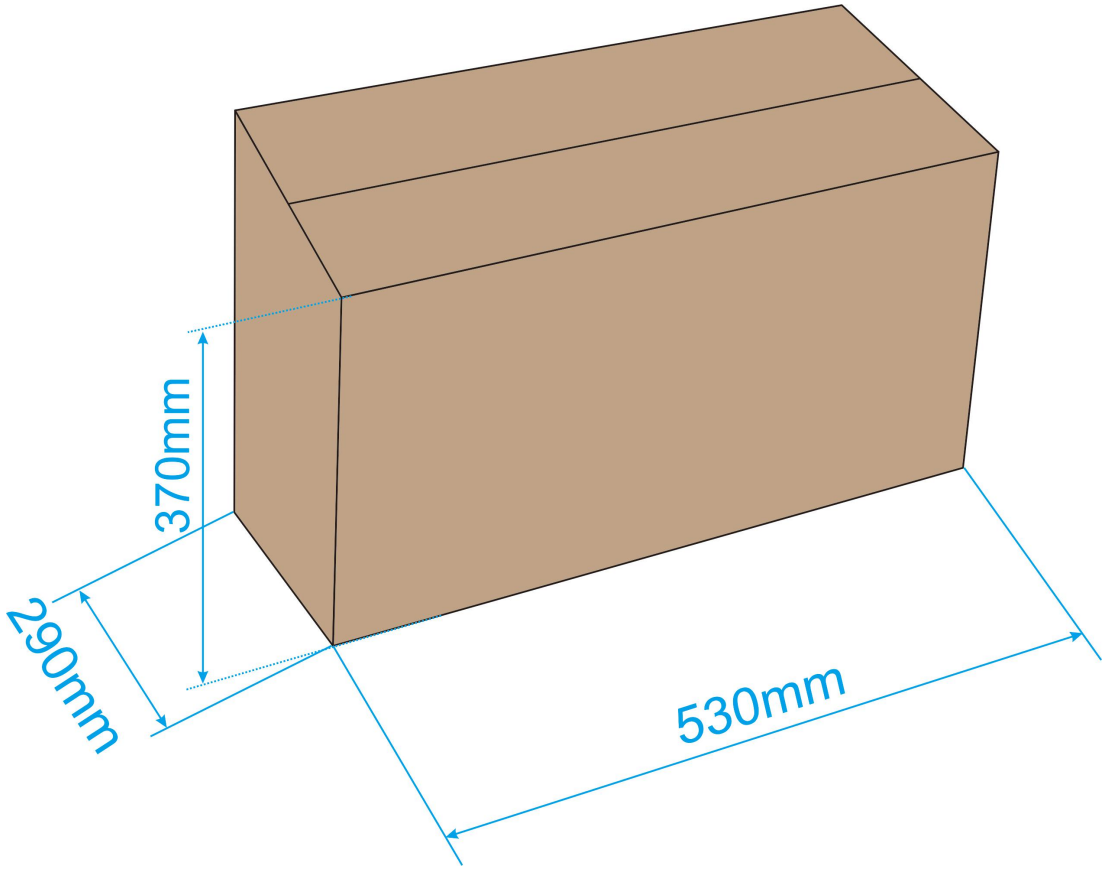
6.3 Each Packing Carton number is 9000.



Product size：16mm*12.5mm*6mm
Net weight：1g



Pallet size: 188.5mm*168mm*7mm
Net weight： 50g
Gross weight：77g



Carton size: 530mm *290mm * 370mm
Net weight： 14.4kg
Gross weight：15.4kg

7. License Agreement

7.1 Without the written permission of the company, it shall not copy or disseminate the content of this specification in any form, nor shall it be disclosed to a third party.

7.2 The company and the third party have the ownership of the software, and the user can only use it after signing the contract or obtaining the software license.

7.3 The contents of this instruction manual are subject to change without prior notice.