Five in One Sensor Module

（Model：ZPHS01）

Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Multi-in-One Sensor Module

Profile

This module integrates Electrochemical formaldehyde,
Semiconductor VOC sensor, Laser particle sensor, NDIR CO2 sensor and temperature& humidity sensor.
Communication Interface: TTL serial, Baud rate:9600, data bits:8, stop bit:1, check bit: no.

Application

➢ Gas detector

➢ Air purifier

➢ Air conditioner

➢ HVAC system

➢ Air quality monitoring

➢ Smart home

Specification

Model	ZPHS01
Target Gas	CO2、PM2.5、CH2O、TVOC、Temperature、Humidity
Interference gas	Alcohol/CO gas…etc.
Working voltage	5V (DC)
Average Current	＜ 200 mA
Interface level	3 V(compatible with 3.3V)
Output signal	UART
Preheat time	≤ 3min
CO2 range	0~5000ppm
PM2.5 range	0~1000ug/m3
CH2O range	0~1.6ppm
TVOC range	4 grades
Tem. range	0～65℃
Tem. precision	±0.5℃
Hum. range	0~100% RH
Hum. precision	±3%
Working Tem.	0～50℃
Working Hum.	15~80% RH(no condensation)
Storage Tem.	0～50℃
Storage Hum.	0~60% RH
Size	72mmx61mm

Table 1: performance parameter
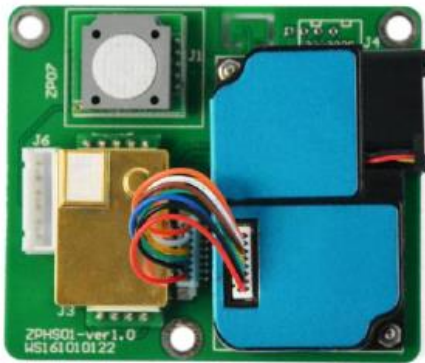
Module Appearance

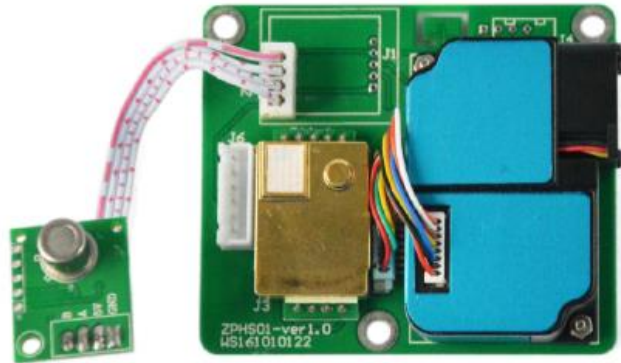Fig 1: CH2O version

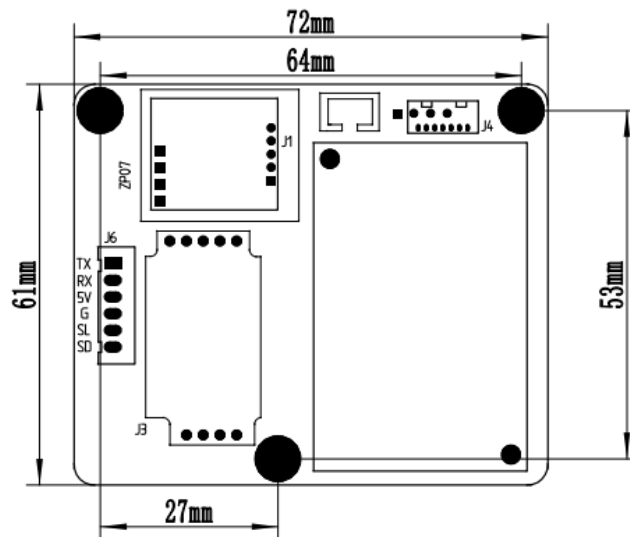Fig 2: VOC version

Module size

Fig 3: Mounting dimension

Pin Definition

PIN1   TX   serial port (circuit board serial port sender) 3V TTL level

PIN2   RX   serial port (circuit board serial port receiver) 3V TTL level

PIN3   +5V   Power input (+5V)

PIN4   GND   Power input (Ground terminal)

PIN5   SL   Reserved

PIN6   SD   Reserved

Serial communication protocol format

The host computer sends the format

Start character	length	Command number	Data 1	……	Data n	checksum
HEAD	LEN	CMD	Data 1	……	Data n	CS
11H	XXH	XXH	XXH	……	XXH	XXH

Detailed protocol format

Protocol format	Detailed explanation
Start character	Upper PC send [11H]，Module responses [16H]
Length	Frame byte length = data length+1（includes CMD+DATA）
Command No	Command number
Data	Data read or written, with variable length
Checksum	Inverse of the sum of data accumulation

Serial protocol command number table

NO.	Function	Command NO.	Description
1	Read the measurement results	0x01	
2	CO2 calibration	0x03	
3	Start/stop dust measurement	0x0c	

Detailed description of protocol

Send：11 02 01 00 EC

Response：16 0B 01   01 9A   00 67   01 EA   03 04   00 36   B4
                        CO2   VOC/CH2O   Humidity   Temperature   PM2.5   CS

Identifying	Decimal valid range	Corresponding value	multiple
CO2	0~5000	0~5000ppm	1
VOC	0~3	0~3 level	1
CH2O	0~2000	0~2000μg/m3	1
PM2.5	0~1000	0~1000ug/m3	1
Temperature	500~1150	0~65℃	10
Humidity	0~1000	0~100%	10

1. The temperature value increases 500 from the actual measurement results, that is, 0 ℃ corresponding to the number of 500.

   Temperature value = (DF7*256+DF8-500)/10

2. The measured value is represented by two bytes, the higher byte in front while the lower byte in the back.

3. After the query command is sent and there is answer, the module will upload the data every second. There is no need to repeat the query command before the power is turned off.

Checksum and calculation

```
unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
{
    unsigned char j,tempq=0;
```

```
        i+=1;
        for(j=0;j<(ln-2);j++)
        {
            tempq+=*i;
            i++;
        }
        tempq=(~tempq)+1;
        return(tempq);
}
```

CO2 zero point calibration

> **send**：11 03 03 01 90 58
>
> **respond**：16 01 03 E6
>
> **function**：CO2 zero point calibration
>
> **Instruction**：zero point means 400ppm，please ensure that the sensor has already been working for 20 mins under 400ppm concentration before sending zero point calibration command.

Start & Stop dust measurement

> Send：11 03 0C DF1 1E C2
>
> Respond：16 02 0C DF1 CS
>
> Function：Start/Stop dust measurement
>
> Instruction：
>
> 1、 Among send command, DF1=2 means starting measurement，DF1=1 means stopping measurement;
>
> 2、 Among respond command, DF1=2 means starting measurement, DF1=1 means stopping measurement;
>
> 3、 When the sensor receives the measurement command, it enters the state of continuous measurement by default. If
>
> Send：11 03 0C 02 1E C0   //start dust measurement
>
> Respond：16 02 0C 02 DA   //the module is in "on-state dust measurement"
>
> Send：11 03 0C 01 1E C1   //stop dust measurement
>
> Respond：16 02 0C 01 DB   //the module is in "off-state dust measurement"

Cautions

1. The PM2.5 sensor on this module is suitable for the detection of dust particles in ordinary indoor environments. The actual use environment should try to avoid soot environment, excessive dust particles, high humidity environment, such as: kitchen, bathroom, smoking room, outdoor, etc. If used in such an environment, appropriate protective measures should be added to prevent viscous particles or large particles from entering the sensor, forming a buildup inside the sensor, and affecting the sensor's performance.

2. The module should avoid contact with organic solvents (including silica gel and other adhesives), coatings, pharmaceuticals, oils and high-concentration gases.

3. The module cannot be completely encapsulated with resin material, and it cannot be immersed in an oxygen-free environment, otherwise the performance of the sensor will be damaged.

4. The module cannot be used in the environment containing corrosive gas for a long time. Corrosive gas will damage the sensor.

5. The module needs to be warmed up for more than 3 minutes when it is powered on for the first time.

6. Do not use this module in systems involving personal safety.

7. Do not use the module in narrow room, the environment should be ventilated well.

8. Do not install the module in a strong convection air environment.

9. Do not place the module in high-concentration organic gas for a long time. Long-term placement will cause the sensor zero point drift and slow recovery.

10. It is prohibited to use hot-melt adhesive or sealant to seal the module with a curing temperature higher than 80℃.

11. The module should be away from the heat source, and avoid direct sunlight or other heat radiation.

12. The module can't be vibrated or shocked.