Digital VOC Module

(Model No.: ZM106-VOC)

Manual

Version: 1.0

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Zhengzhou Winsen Electronic Technology Co., Ltd

Statement

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes &etc, please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

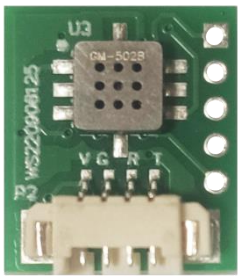
Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

Digital ZM106-VOC Module

Product description:

Digital ZM106-VOC Module is a general purpose, compact module. The module uses a semiconductor gas sensor with MEMS process to detect the concentration of VOC gas in the environment. The module has high sensitivity and adopts digital signal output, which is convenient for users to use and test, and greatly shortens the user's design and development cycle.



Characteristics:

- Small size
- Low power consumption
- High precision
- High sensitivity
- High resolution
- Wide range of applications
- Excellent long-term stability
- UART signal output

Applications:

Air purifier, ventilation system, intelligent integrated ceiling, air quality monitor, ventilation fan, air conditioner and other air pollution detection.

Parameters:

Table 1.

Sensor Type	ZM106-VOC
Detection Gas	Ethanol, formaldehyde, toluene and other organic volatiles
Output Signal	UART (TTL level 3.3V)
Working Voltage	5V±0.1V（DC）
Preheat Time	5min
Response Time	≤ 30s
Recovery Time	≤ 60s
Measuring Range	0～10mg/m^3
Resolution	0.01mg/m^3
Working Temperature	-10℃~55℃
Working Humidity	15%RH-90%RH (No Condensation）
Storage Temperature	-10℃~55℃

Module Structure Diagram

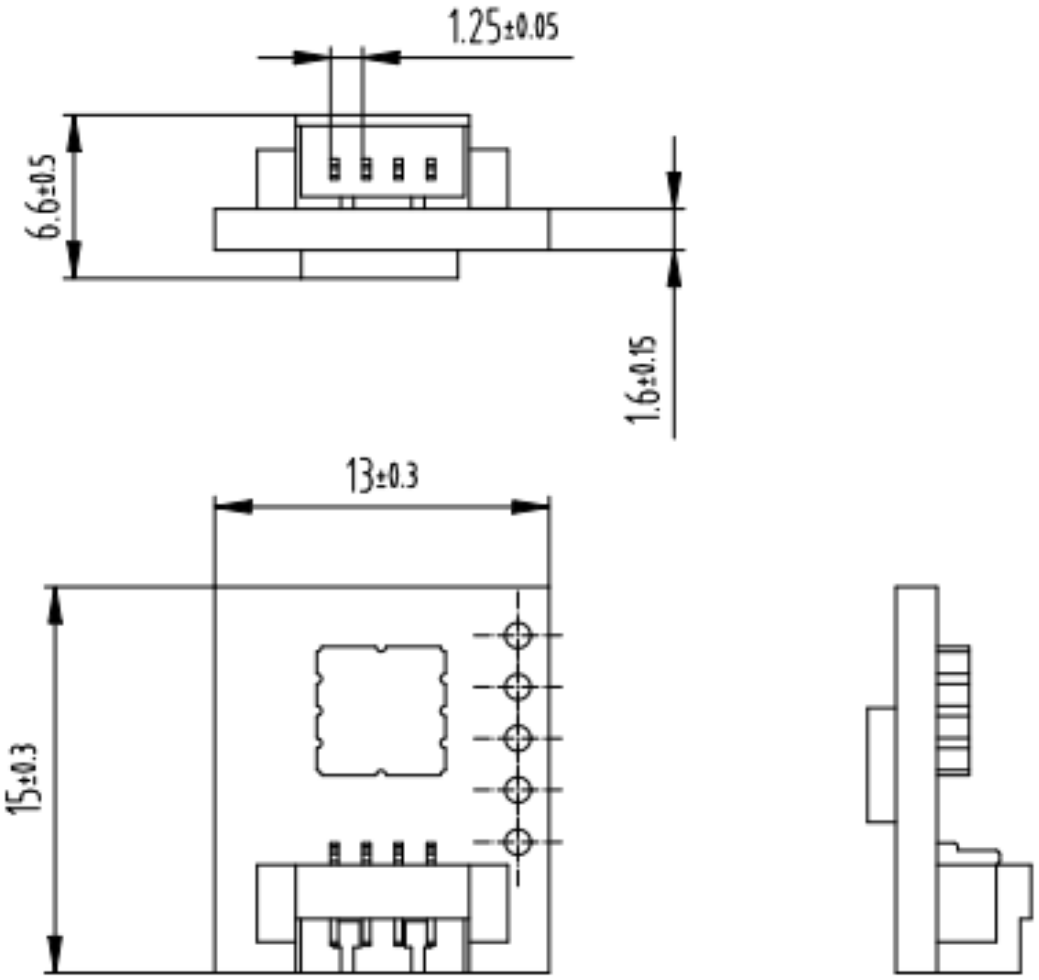


Fig1. Module Structure Diagram

Pin Definition

Table 2.

PIN1	Vin (Voltage input 5V±0.1V)
PIN2	GND
PIN3	UART (RXD)
PIN4	UART (TXD)

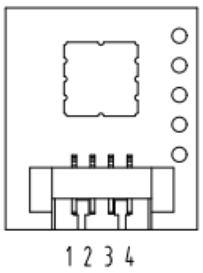


Fig2. Pin Definition

Communication Protocol

1 General Settings

Table 3.

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None

2 Commands

Communications are divided into active uploads and Q&A. The default communication mode is active upload mode, module sends the concentration value every 1s interval.

If user switches to Q&A mode, and needs to switch from Q&A to active upload mode, send command as below:

Table 4.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Switch Command	Active Upload	Reserved	Reserved	Reserved	Reserved	Checksum
0xFF	0x01	0x78	0x40	0x00	0x00	0x00	0x00	0x47

Data format under active upload mode is as following:

Table 5.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Gas Type (VOC)	Unit (mg/m^3)	Decimal Point	High byte of gas concentration	Low byte of gas concentration	High byte of full scale	Low byte of full scale	Checksum
0xFF	0x34	0x11	0x02	0x01	0xC2	0x03	0xE8	0x0B

Note: Need to convert hexadecimal data to decimal data For example: FF 34 11 02 01 C2 03 E8 0B

Gas concentration =(HIGH byte of full scale* 256 + LOW byte of full scale)*Resolution

Gas concentration =(1*256+194)*0.01=4.50 mg/m^3

A decimal place of 0 indicates a resolution of 1; a decimal place of 1 indicates a resolution of 0.1; and a decimal place of 2 indicates a resolution of 0.01.

When the user needs to switch to the Q&A mode, the active upload mode can be turned off by sending the following command. The format of the command line for closing the active upload is as follows:

Table 6.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Switch Command	Q&A	Reserved	Reserved	Reserved	Reserved	Checksum
0xFF	0x01	0x78	0x41	0x00	0x00	0x00	0x00	0x46

Command format of reading concentration, under Q&A mode is as following:

Table 7.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Command	Reserved	Reserved	Reserved	Reserved	Reserved	Checksum
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Return value as below:

Table 8.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Command	High byte of gas concentration (mg/m^3)	Low byte of gas concentration (mg/m^3)	Decimal point	Reserved	High byte of full scale	Low byte of full scale	Checksum
0xFF	0x86	0x01	0xC2	0x02	0x00	0x03	0xE8	0xCA

Note: Need to convert hexadecimal data to decimal data For example: FF 86 01 C2 02 00 03 E8 CA

Gas concentration =(HIGH byte of full scale* 256 + LOW byte of full scale)*Resolution

Gas concentration =(1*256+194)*0.01=4.50 mg/m^3

A decimal place of 0 indicates a resolution of 1; a decimal place of 1 indicates a resolution of 0.1; and a decimal place of 2 indicates a resolution of 0.01.

3 Checksum calculation

Checksum = (Negative (Byte1+Byte2+Byte3+Byte4+Byte5+Byte6+Byte7)) + 1

The reference routines are as follows:

```
/*****************************************************************************
* The function name: ucharFucCheckSum(uchar *i,ucharln)
* Function description: Sum check (take the sum of 1\2\3\4\5\6\7 of the send and receive protocols and negative +1)
* Function description: the elements of the array 1 - the penultimate element of the sum of inverse + 1 (the number of elements must be greater than 2)
*****************************************************************************/
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);
}
```

Instructions

Preheating time

The sensors resistance will drift reversibly if it's stored for long time without electrify. The sensors need to be warmed up before use to achieve internal chemical equilibrium, the storage time and the corresponding warm-up time are recommended as follows:

Table 9.

Storage Time	Suggested aging time
Less than one month	No less than 24 hours
1 ~ 6 months	No less than 48 hours
More than six months	No less than 72 hours

Cautions

1. Following conditions must be prohibited

1.1 Exposed to organic silicon steam

Sensing material will lose sensitivity and never recover if the sensor absorbs organic silicon steam. Sensors must avoid exposing to silicon bond, fixature, silicon latex, putty or plastic contain silicon environment.

1.2 High Corrosive gas

If the sensors are exposed to high concentration corrosive gas (such as H_2S, SO_X, Cl_2, HCl etc.), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

1.3 Alkali, Alkali metals salt, halogen pollution

The sensors performance will be changed badly if sensors be sprayed polluted by alkali metals salt especially brine, or be exposed to halogen such as fluorine.

1.4 Touch water

Sensitivity of the sensors will be reduced when spattered or dipped in water.

1.5 Freezing

Do avoid icing on sensor's surface, otherwise sensing material will be broken and lost sensitivity.

1.6 Applied voltage

Overloaded heating power caused by an overload voltage can cause irreversible damage to the sensor, and static electricity can also damage the sensor, so take anti-static measures when touching the sensor.

2. Following conditions must be avoided

2.1 Water Condensation

Indoor conditions, slight water condensation will influence sensors' performance lightly. However, if water condensation on sensors surface and keep a certain period, sensors' sensitive will be decreased.

2.2 Used in high gas concentration

No matter the sensor is electrified or not, if it is placed in high gas concentration for long time, sensors characteristic will be affected. If lighter gas sprays the sensor, it will cause extremely damage.

2.3 Long time exposed to adverse environment

No matter the sensors electrified or not, if exposed to adverse environment for long time, such as high humidity, high temperature, or high pollution etc., it will influence the sensors' performance badly.

2.4 Vibration

Continual vibration will result in sensors down-lead response then break. In transportation or assembling line, pneumatic screwdriver/ultrasonic welding machine can lead this vibration.

2.5 Concussion

If sensors meet strong concussion, it may lead its lead wire disconnected.

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