



Electrochemical CH₂O Detection Module

Model: ZE08K-CH₂O

User's Manual

Version: 1.3

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Electrochemical CH2O Detection Module ZE08K-CH2O

Description

ZE08K-CH2O is a universal and miniaturization electrochemical formaldehyde detection module. It utilizes electrochemical principle to detect CH2O in air which makes the module with good selectivity and stability. It is built-in temperature sensor to make temperature compensation. It has the digital output and analog voltage output at the same time. It combines mature electrochemical detection technology with a good circuit design.



Features

- *High sensitivity & resolution, Low power consumption, Long life
- *UART/Analog Voltage output * Good stability, excellent ability of Anti-interference
- * Temperature compensation , Excellent Linear output

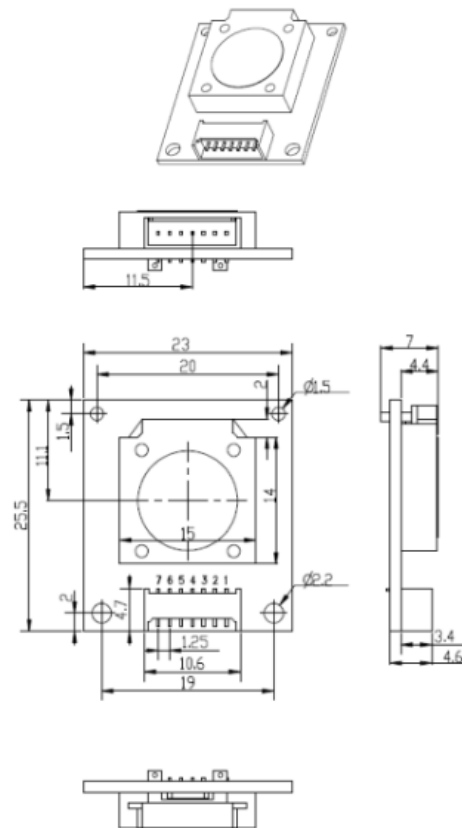
Main Application

Portable detector, air-quality monitor, air cleaner, air renewal system, air conditioner, smart home.

Technical Parameters

Table 1.

Model No.	ZE08K-CH2O
Target Gas	CH2O
Interference Gas	Alcohol, CO &ect.
Output Data	DAC(0.4~2V standard voltage output, corresponding concentration: 0 ~ full scale)
	UART output(3V TTL Electrical Level)
	PWM (3V)
Working Voltage	3.7V~5.5V
Warm up time	≤3 minutes
Response time	≤60s
Resume time	≤60s
Detection Range	0~5ppm
Resolution	≤0.01ppm
Operating Temp.	-20°C~50°C
Operating Hum.	15%RH-90% RH(No condensation)
Storage temp.	0~25°C
Working life	5 years (in clean air 18 °C ~ 25 °C)

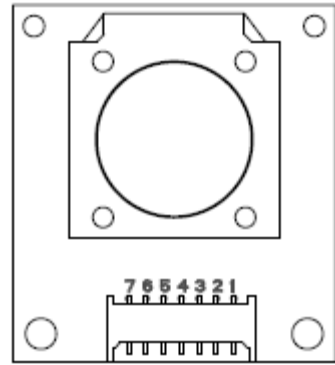


Pic 1: Module structure

Pin Description:

Table 2

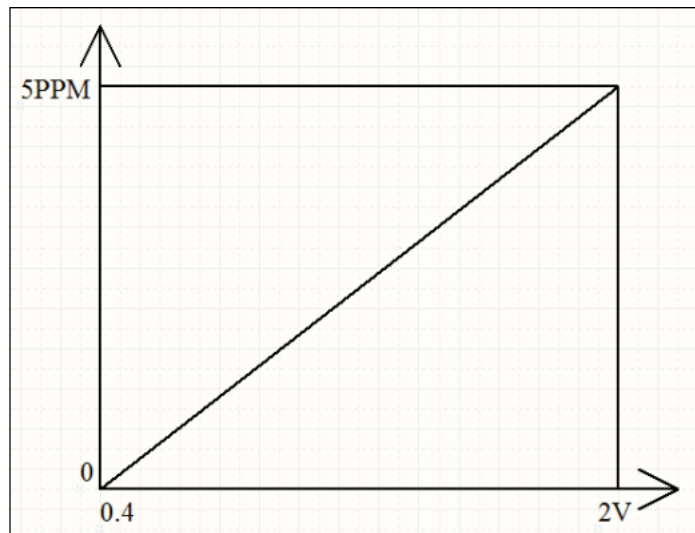
PIN	Instruction
Pin1	Reserved
Pin2	DAC (0.4~2V for 0-full scale)
Pin3	GND
Pin4	Vin (Voltage input 3.7V~5.5V)
Pin5	UART (RXD) 0~3.0V data input
Pin6	UART (TXD) 0~3.0V data output
Pin7	Reserved



Pic 2. Pin figure of the Module

Analog Voltage Output(DAC)

(The formaldehyde concentration corresponding to 0.4-2V is 0-5ppm). Compare the output voltage with the reference voltage, and then calculate the gas output concentration according to the corresponding relationship between the voltage and the concentration.



UART Output Model

Communication Protocol:

1. General Settings

Table 3

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None

2. Commands

There are two communication type: active upload type and Q&A type. The default type for this module is active upload and it sends gas concentration every other one second.

If the user switched to the question & answer mode, want to re-switch to active upload, please send the following command line format:

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

Active upload data display format is as follows:

Table 5

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Gas Name CH2O	Unit ppb	No decimal byte	Concentration (High Byte)	Concentration (Low Byte)	Full Range (High Byte)	Full Range (Low Byte)	Checksum
0xFF	0x17	0x04	0x00	0x00	0x25	0x13	0x88	0x25

Note: Gas concentration value=High byte of concentration *256+ Low byte of concentration.

When converted to PPM: PPM = PPB / 1000. 1PPM x 1.25 = 1.25mg / m3

When the user needs the Q&A mode, he can turn off the actively uploaded data by sending the following command format, and then send the command to read the concentration. The command-line format for turning off active uploads 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

In question and answer mode, the command format for reading the concentration is as follows:

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

The returned sensor density value display format is as follows:

Table 8

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	command	High byte(ug/m3)	Low byte (ug/m3)	reserve d	reserved	High byte (ppb)	High byte (ppb)	checksum
0xFF	0x86	0x00	0x28	0x00	0x00	0x00	0x20	0x32

Gas concentration value=High byte of concentration *256+ Low byte of concentration

3 .Checksum and calculation

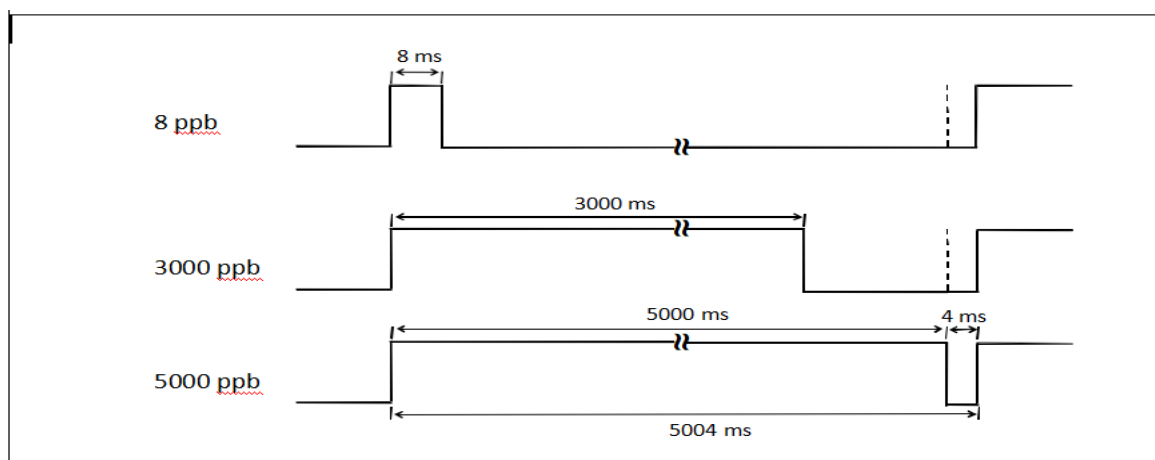
```

/*****
* Function Name: unsigned char FucChecksum(uchar *i,ucharIn)
* Functional description: Sum check 【Take Not(Byte1+Byte2+...Byte7) +1】
* Function declaration: Take Not(Byte1+Byte2+...ByteX (X>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);
}
    
```

PWM output

Formaldehyde concentration output range	8 ~ 5000ppb
Cycle	5004 ms ± 5%
High level Cycle	5000 ms ± 5%
End of cycle low output	4 ms (Theoretical value)
Calculation formula of current formaldehyde concentration: $C_{ppb} = 5000 \times TH / (TH + TL - 4ms)$	
C _{ppb} is the calculated formaldehyde concentration (unit: ppb)	
TH is the high level output time in a cycle	
TL is the low level output time in a cycle	



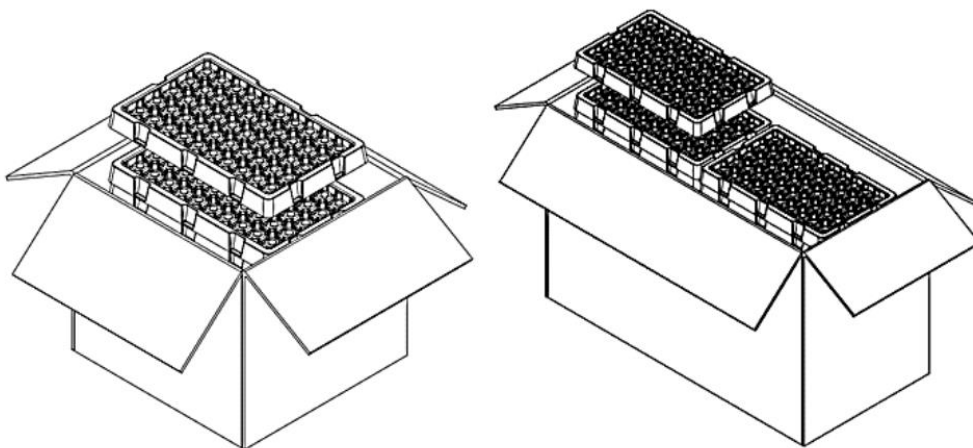
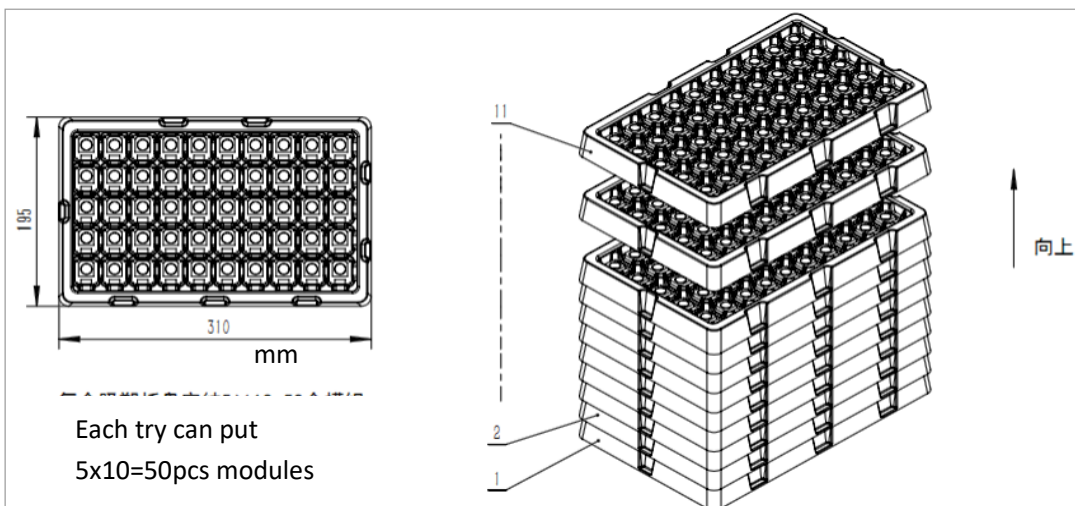
Cross interference gas

Table 9

Gas	Concentration/ppm	Equivalent CH ₂ O/ppm
CH ₂ O	5	5
C ₆ H ₆	10	0.1
C ₇ H ₈	10	0.46
C ₂ H ₄ O ₂	200	0.52
C ₂ H ₅ OH	10	0.2
H ₂ S	10	12
CO	200	0.7

Packing:

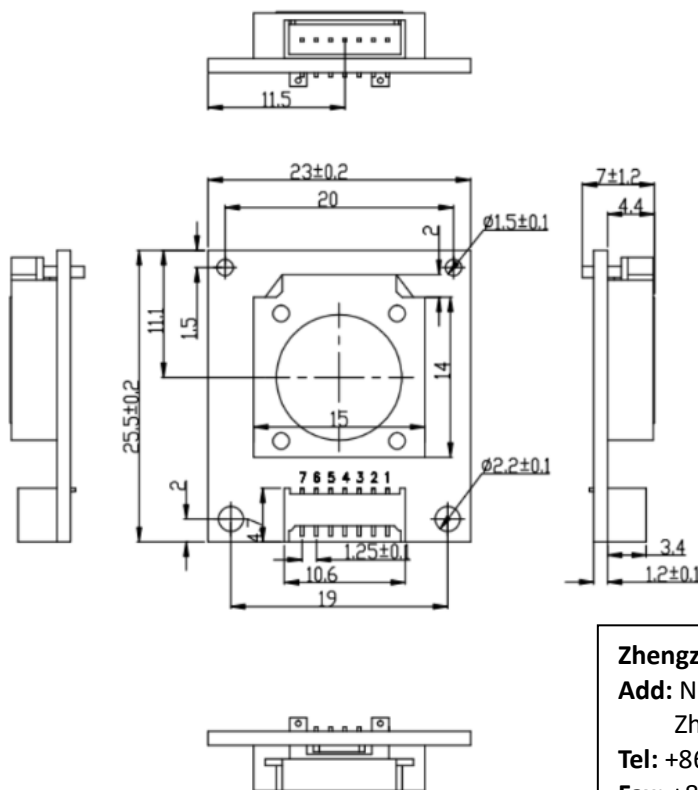
1. Place the sensor in the same direction in the blister tray.
2. Place the sensor's blister trays in the appropriate number of layers according to the box specifications.
3. Place the packaged sensor in the carton.
4. The carton is sealed and packed.
5. Orders with a single shipment less than the minimum package are not subject to this specification.



Cautions:

1. The module should avoid contact with organic solvents (including silicone and other adhesives), paints, chemicals, oils and high concentration gases.
2. The module should not be completely encapsulated with resin materials or immersed in an oxygen-free environment, otherwise it will damage the performance of the sensor;
3. The module can not be used in the environment containing corrosive gas for a long time, corrosive gas will damage the sensor;
4. The module cannot withstand excessive impact or vibration.
5. The module should be preheated for 24-48 hours for the first power on, so that the module can be fully stabilized before normal testing.
6. Do not use the module in systems involving personal safety.
7. Do not install the module in a strong convection air environment.
8. Do not place the module in high concentration of organic gas for a long time. Long-term placement will cause the sensor zero to drift and slow recovery.
9. It is forbidden to encapsulate the module with hot melt glue or sealant with curing temperature higher than 80℃;
10. It is prohibited to store and use the sensor in high-concentration alkaline gas for a long time.

Structure size drawing



Unit: mm

Tolerance: ±0.2mm

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