MH-Z16

Intelligent Infrared Gas Module

Manual

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1 Profile

Main functions and features：

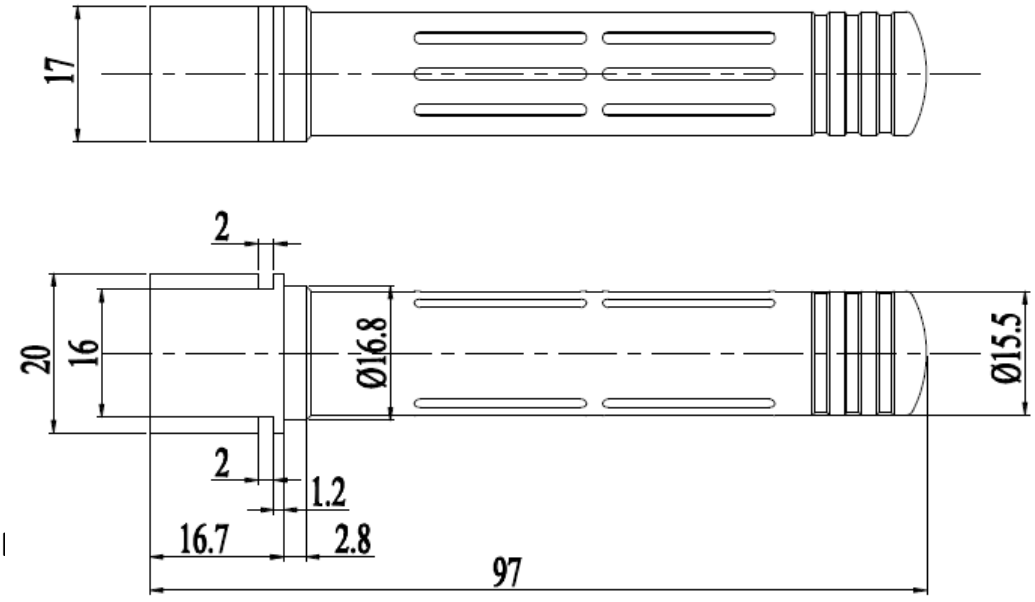
- High sensitivity,High resolution
- Low power consumption
- Output method:UART,analog voltage signal,PWM wave
- Quick response
- Temperature compensation,excellent linear output
- Good stability
- Long lifespan
- Anti water vapor interference
- No poisoning

2 Main technical parameters

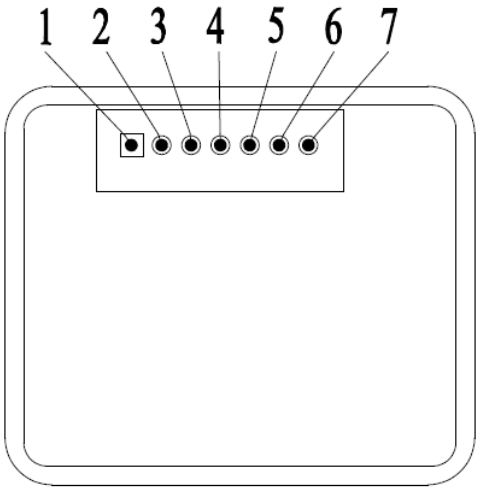
Working voltage	4.5 V ~ 5.5V DC
Average current	＜ 85 mA
Interface level	3.3 V
Measuring range	0~5%VOL optional
Output signal	PWM
	UART
Preheat time	3min
Reponse Time	T_{90} ＜ 30s
Working temperature	0℃ ~ 50℃
Working humidity	0~95%RH
Weight	21 g
Lifespan	>5 years

Target Gas	Measuring Range	Accuracy	Mark
Carbon Dioxide (CO2)	0~2000ppm	±(50ppm +5%reading value)	Temperature compensation
	0~5000ppm		Temperature compensation
	0~1%VOL		Temperature compensation
	0~3%VOL		Temperature compensation
	0~5%VOL		Temperature compensation

3.Structure

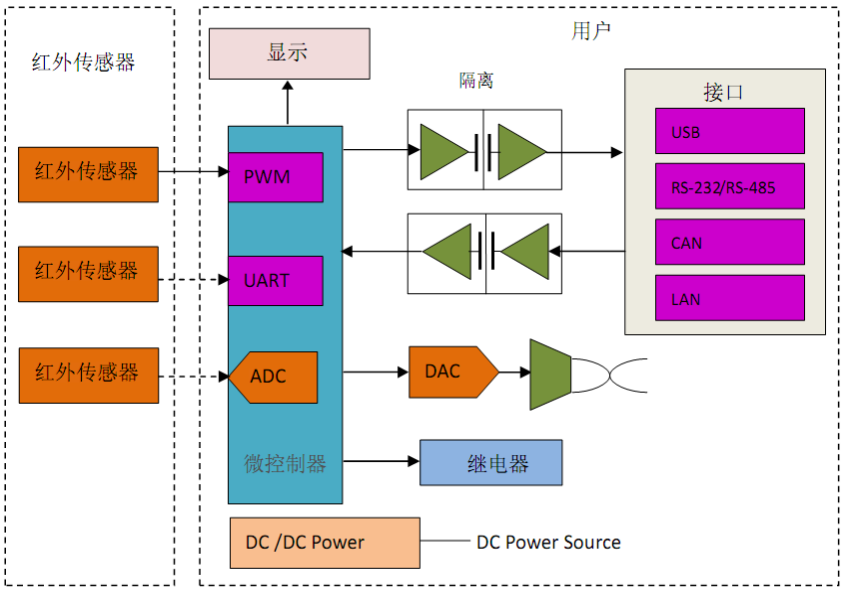


4.Pin



PIN	Description
Pad4	Vin(input voltage 4.5V～5.5V)
Pad3	GND
Pad2	Vout (0.4～2V,custom made)
Pad7	PWM
Pad1	HD
Pad5	UART（RXD） 0～3.3V input digital
Pad6	UART（TXD） 0～3.3V output digital

5.Circuit



6. Operating instruction

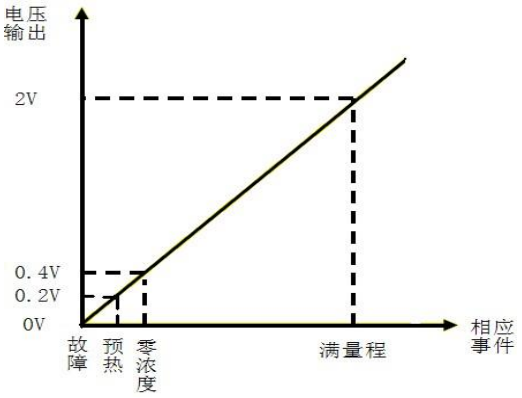
6.1 Analog output connections

The output value of Vout is 0.4-2.0V, which stands for 0 to full range

Vin –5V

GND- Power Ground

Vout-ADC input



6.2PWM output (taking PWM output from 2000ppm as example):

CO2 output range: 0ppm-2000ppm

Cycle: 1004ms±5%

High level output for beginning: 2ms (in name)

Middle of cycle: 1000ms±5%

Low level output for ending: 2ms（in name）

Account formula for CO2 concentration which gets through PWM:

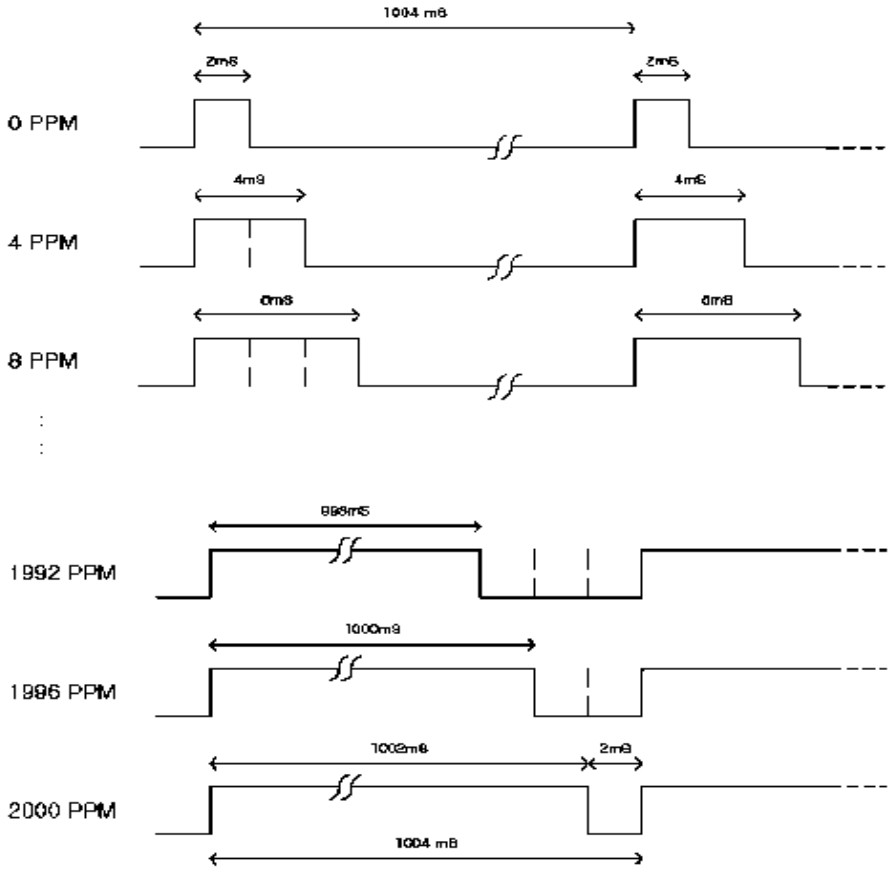
$$C_{ppm} = 2000 \times (T_H - 2ms) / (T_H + T_L - 4ms)$$

Among:

C_{ppm} is calculated CO2 concentration, unit is ppm;

T_H is time for high level during an output cycle;

T_L is time for low level during an output cycle.



6.3 Digital connects:

Vin-5V power

GND- Power Ground

RXD connect sensor TXD

TXD connect sensor RXD

You can read gas concentration via Uart, no need to calculate.

6.3.1communication protocol

1.General Settings

Baud rate	9600
Date byte	8 byte
Stop byte	1byte
Calibrate byte	no

2.Command

Each command or return：

Contains 9 bytes (byte 0 ~ 8)

starting byte fixed 0 XFF

command contains sensor number (factory default to 0 x01)
to check and end

Command List:

0x86	Gas concentration
0x87	Calibrate zero point (ZERO)
0x88	Calibrate span point (SPAN)

Read gas concentration

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Starting byte	Sensor No.	command	-	-	-	-	-	Check value
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Return value

Return								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Starting byte	command	High level concentration	Low level concentration	-	-	-	-	Check value
0XFF	0x86	0x02	0x60	0x47	0x00	0x00	0x00	0xD1

Gas concentration= high level *256+low level

Calibrate zero point

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Starting byte	Sensor No.	command	-	-	-	-	-	Check value
0XFF	0x01	0x87	0x00	0x00	0x00	0x00	0x00	0x78

No return value

Calibrate span point

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Starting byte	Sensor No.	command	High level span point	Low level span point	-	-	-	Check value
0XFF	0x01	0x88	0x07	0xD0	0x00	0x00	0x00	0xA0

No return value

3.Calibrate and calculate

The checksum = (invert (byte 1 +... + 7)) + 1

Reading gas concentration:

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Starting byte	Sensor No.	command	-	-	-	-	-	Check value
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Except byte 0 ,add the other bytes together

0x1 + 0x86 + 0 + 0 + 0 + 0 + 0 = 0x87

Get the value from the first step, then invert it.

0xff - 0x87 = 0x78

The second value plus one

0x78 + 0x01 = 0x79

Program :C language

```
char getCheckSum(char *packet)
{
    char i, checksum;
    for( i = 1; i < 8; i++)
    {
        checksum += packet[i];
    }
    checksum = 0xff – checksum;
    checksum += 1;
    return checksum;
}
```

7. Notes for maintenance

7.1 The sensor should be calibrated regularly. The cycle time is better to be no more than 6 months.

7.2 Do not use the sensor in the high dusty environment for long time.

7.3 Please use the sensor with correct power supply.

7.4 Forbidden to cut the sensor pin.

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