Intelligent Infrared CO2 Module

(Model: MH-Z19)

User's Manual

(Version: 1.0)

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Zhengzhou Winsen Electronics Technology Co., Ltd

ISO9001 certificated company

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Zhengzhou Winsen Electronics Technology CO., LTD.

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MH-Z19 NDIR CO2 Module

1. Profile

MH-Z19 NDIR infrared gas module is a common type, small size sensor, using non-dispersive infrared (NDIR) principle to detect the existence of CO 2 in the air, with good selectivity, non-oxygen dependent and long life. Built-in temperature sensor can do temperature compensation; and it has UART output and PWM output. It is developed by the tight integration of mature infrared absorbing gas detection technology, precision optical circuit design and superior circuit design.

2. Applications

MH-Z19 NDIR infrared gas module is widely used in the HVAC refrigeration and indoor air quality monitoring.

3. Main Functions and Features

High sensitivity, high resolution

Low power consumption

Output modes: UART and PWM wave

Temperature compensation, excellent linear output

Good stability

Long lifespan

Anti-water vapor interference

No poisoning

4. Technical Parameters and Structure

Product Model	MH-Z19
Target Gas	CO2
Working voltage	3.6 ~ 5.5 V DC
Average current	< 18 mA
Interface level	3.3 V
Measuring range	0 ~ 0.5% VOL optional (refer to Table 2)
Output signal	UART
	PWM
Preheat time	3 min
Reponse Time	T_{90} < 60 s
Working temperature	0 ~ 50 ℃
Working humidity	0 ~ 95% RH (No condensation)
Dimension	33 mm×20 mm×9 mm (L×W×H)
Weight	21 g
Lifespan	> 5 years

Table 1 Main Technical Parameters

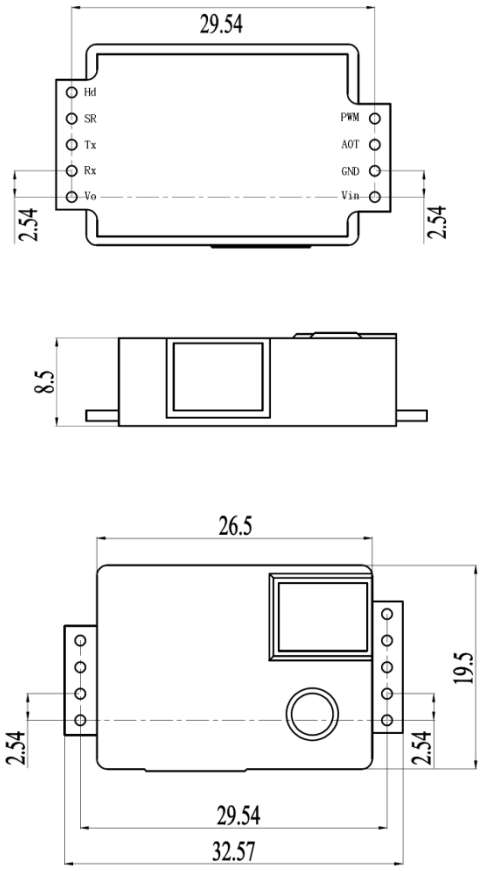

Figure 1 Structure

Target Gas	Formula	Measuring Range	Accuracy	Remark
Carbon Dioxide (CO2)	CO_2	0～2000 ppm	± (50ppm+5% reading value)	Temperature compensation
		0～5000 ppm		Temperature compensation

Table 2 Measuring Range and Accuracy

5. Pins

PIN	Description
Pin 6	Vin (voltage input)
Pin 7	GND
Pin 1	Vout (output voltage 3.3V, output current lower than 10mA)
Pin 9	PWM
Pin 5	HD (zero calibration, low level above 7 seconds) (Factory Reserved)
Pin 2	UART (RXD) 0~3.3V digital input
Pin 3	UART (TXD) 0~3.3V digital output
Pin 4	SR (Factory Reserved)
Pin 8	AOT (Factory Reserved)

Table 3 Definition for Pins

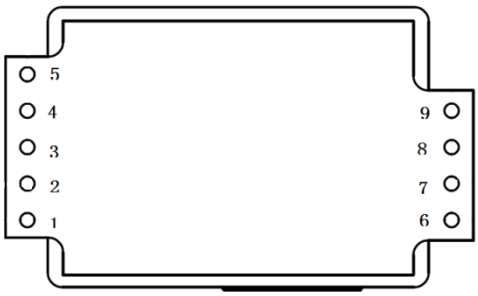

Figure 2 Pins Diagram

6. Application Circuit

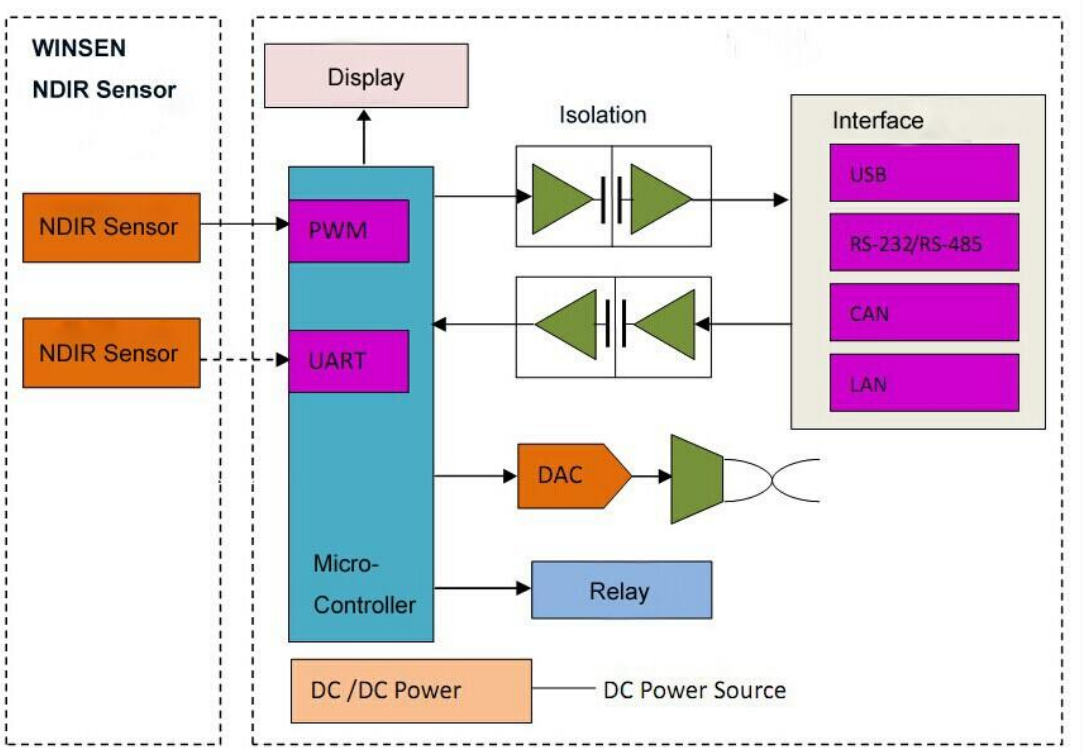

Figure 3 Application Circuit

7. Output Data Reading

7.1 PWM output (taking PWM output of 0~2000ppm detection range as example)

CO2 output range: 0ppm-2000ppm

Cycle: 1004ms ± 5%

High level output for beginning: 2ms ± 5%

Middle of cycle: 1000ms ± 5%

Low level output for ending: 2ms ± 5%

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.

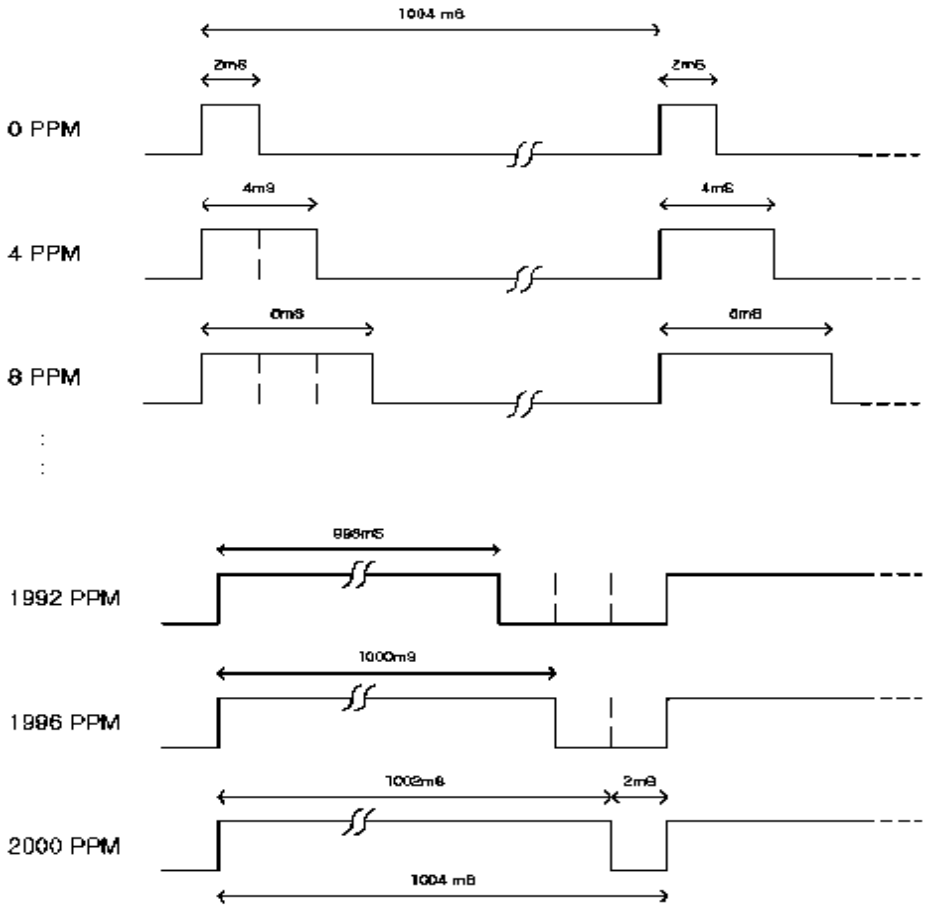

Figure 4 PWM Output

7.2 Transmit Data

Vin-5V power

GND- Power Ground

RXD connect sensor TXD

TXD connect sensor RXD

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

7.2.1 Communication Protocol

A. General Settings

Baud rate	9600
Date byte	8 byte
Stop byte	1byte
Parity (check bits)	no

B. Command

Each command or return：

Contains 9 bytes (byte 0 ~ 8)

starting byte fixed to 0xFF

command contains sensor number (factory default is 0 x01)

end with proof test value Checksum (refer to below Calibrate and Calculate method)

Command List

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

Gas concentration reading

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

C. Calibrate and Calculate

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

Gas concentration reading

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

7.2.2 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;
}
```

8. Notes

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

8.2 Please use the sensor with correct power supply.

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