



# Intelligent Infrared CO2 Module (Model: MH-Z19)

## User's Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd

ISO9001 certificated company

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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.**

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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<sub>2</sub> 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

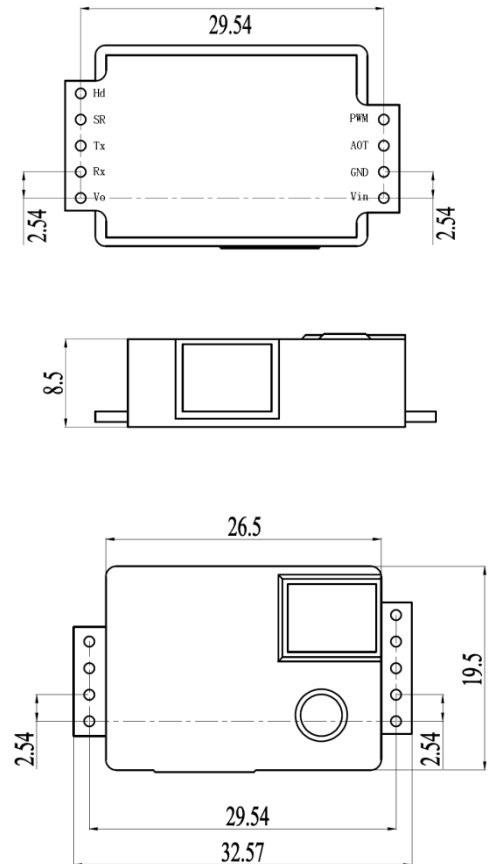
MH-Z19 NDIR infrared gas module is widely used in the HVAC refrigeration and indoor air quality monitoring.

### 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	CO <sub>2</sub>
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 <sub>90</sub> < 60 s
Working temperature	0 ~ 50 °C
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 (CO <sub>2</sub> )	CO <sub>2</sub>	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)

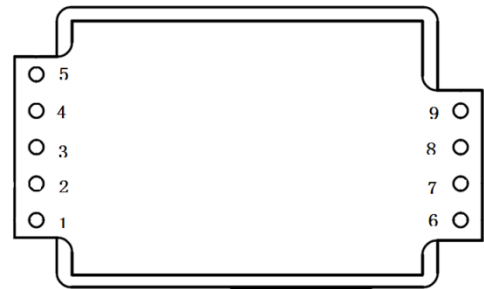


Table 3 Definition for Pins

Figure 2 Pins Diagram

## 6. Application Circuit

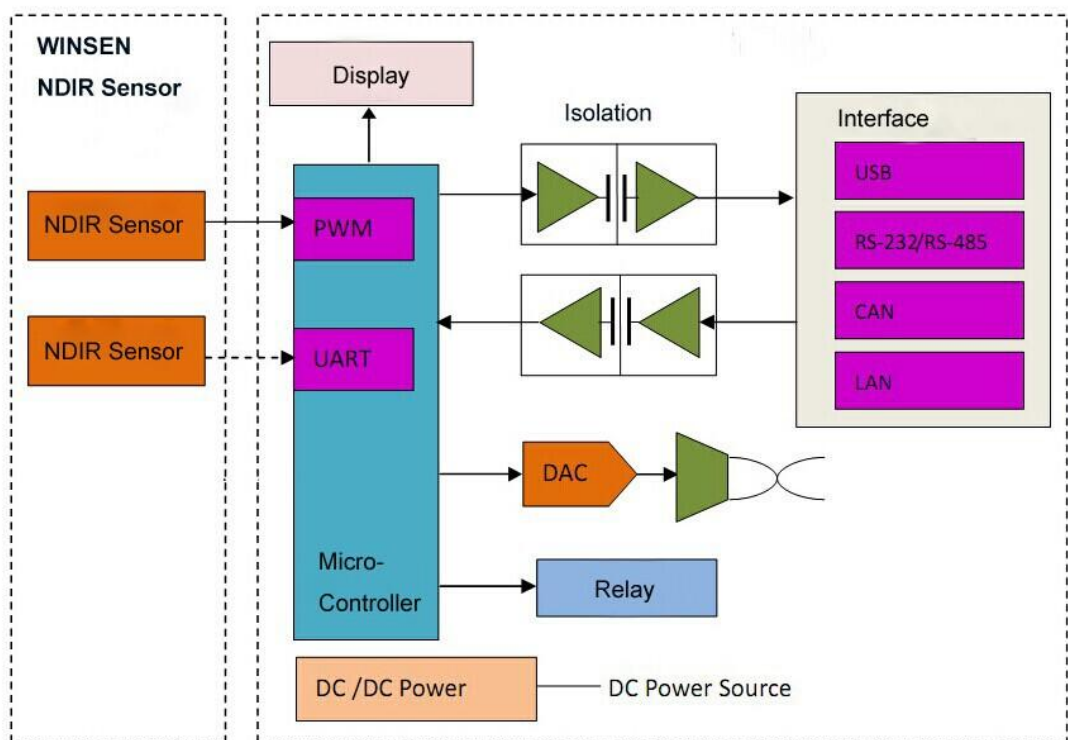


Figure 3 Application Circuit

## 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.

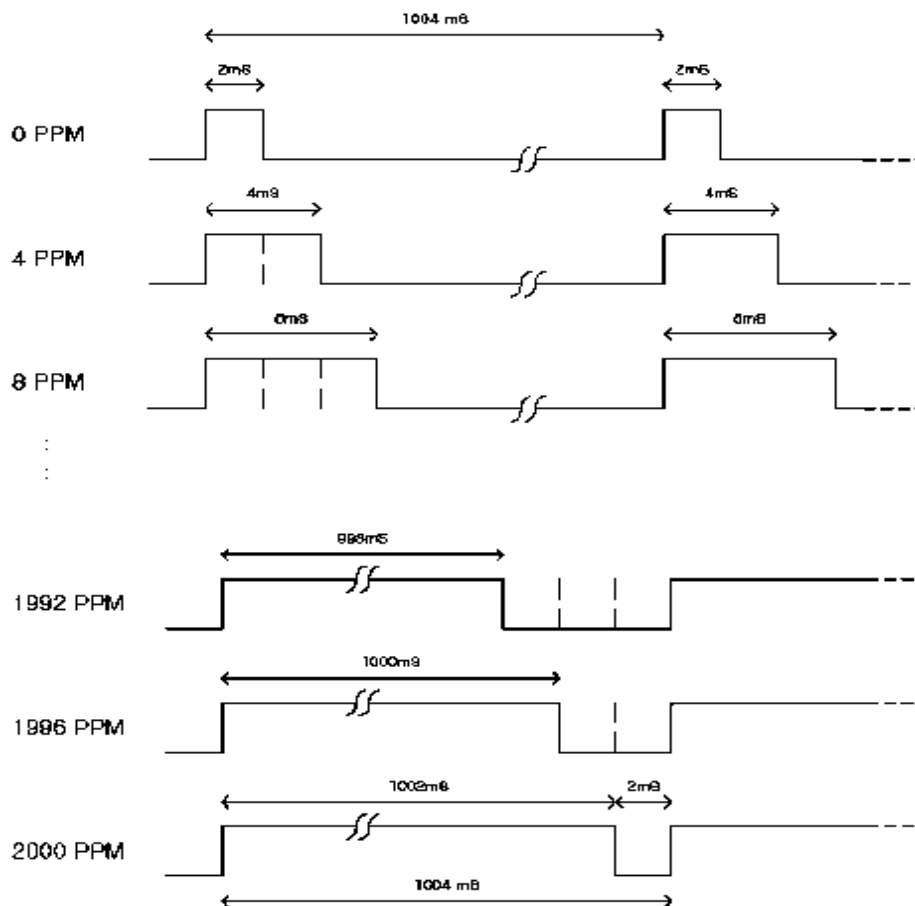


Figure 4 PWM Output

## 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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