



# **Infrared CO2 Sensor Module**

## **(Model: MH-Z19C)**

### **User's Manual**

**(Version 1.2)**

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**ISO9001 Certificated Company**

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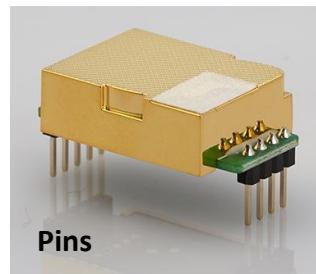
Please keep the manual properly, in order to get help if you have questions during the usage in the future.

**Zhengzhou Winsen Electronics Technology CO., LTD.**

## MH-Z19C NDIR CO2 Module

### Profile

MH-Z19C NDIR infrared gas module is a common type, small size sensor, pins type or terminal type, 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 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.



### Applications

- \*HVAC refrigeration
- \*Indoor air quality monitoring
- \*Ventilation system
- \*Air cleaner device
- \*Smart home
- \*School

### Main Features

- \*Chamber is gold plated
- \*High sensitivity, low power consumption
- \*Good stability
- \*Temperature compensation, excellent linear output
- \*Multiple output modes: UART, PWM
- \*Long lifespan
- \*Anti-water vapor interference, anti-poisoning

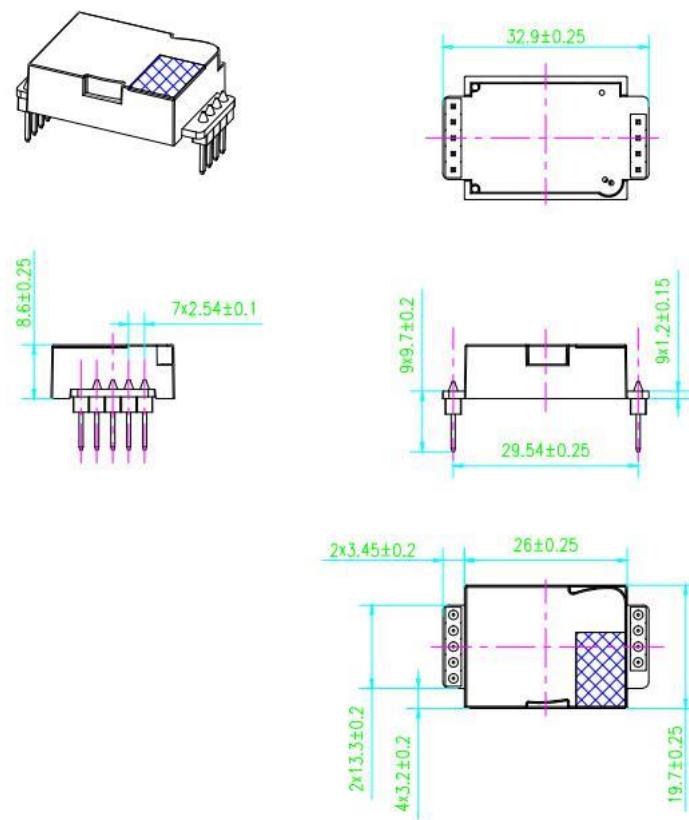
### Main parameters

Model No.	MH-Z19C
Detection Gas	CO <sub>2</sub>
Working voltage	5.0±0.1V DC
Average current	< 40mA (@5V power supply)
Peak current	125mA (@5V power supply)
Interface level	3.3 V (Compatible with 5V)
Detection Range	400~10000ppm(optional)
Output signal	Serial Port (UART) (TTL level 3.3V)
	PWM
Preheat time	1 min
Response Time	T <sub>90</sub> < 120 s
Working temperature	-10 ~ 50 °C
Working humidity	0 ~ 95% RH (No condensation)
Storage temperature	-20~60 °C
Weight	5 g
Lifespan	> 10 years

## Detection range and accuracy

Detection Gas	Formula	Detection Range	Resolution	Accuracy
Carbon Dioxide	CO2	400~2000ppm	1ppm	$\pm (50\text{ppm}+5\% \text{ reading value})$
		400~5000ppm		
		400-10000ppm		

## Dimensions(Pins type)



## Pins connection type:

Pin	Pin Definition
Vin	Positive pole of power (Vin)
GND	Negative pole of power (GND)
PWM	PWM
Hd	HD(zero point calibration, low level lasting for over 7s is effective)
Rx	UART(RXD)TTL Level data input
Tx	UART(TXD)TTL Level data output

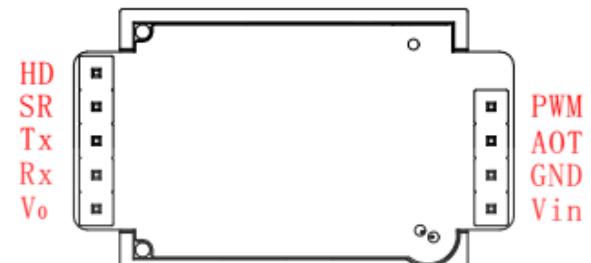
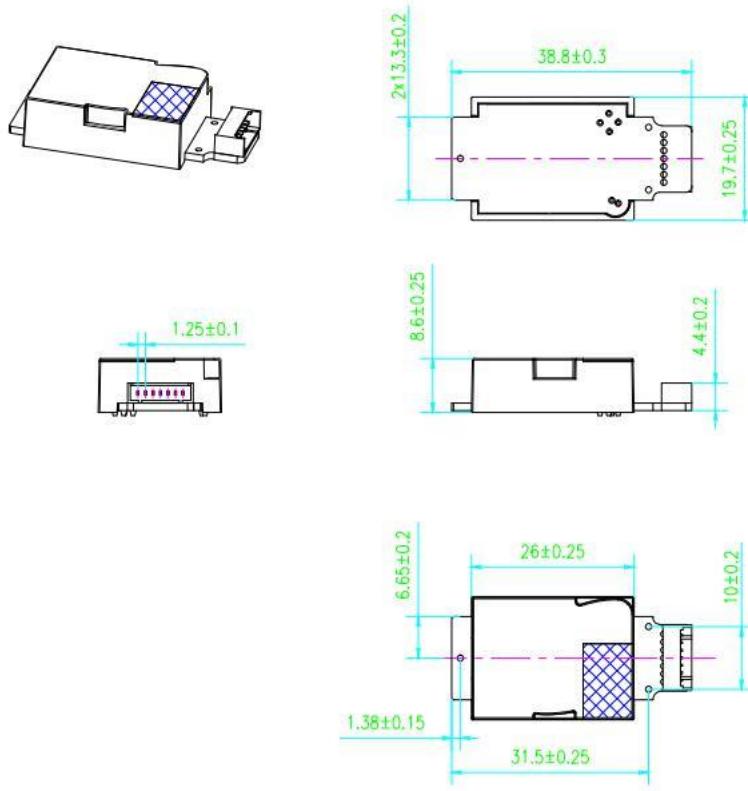


Fig3.from bottom

## Dimensions(Terminal type)



## Terminal connection type

Pin	Terminal pin Definition
Pin 4	Vin power in
Pin 3	GND
Pin 2	Reserved
Pin 7	PWM
Pin 1	HD(zero point calibration, low level lasting for over 7s is effective)
Pin 5	UART(RXD)TTL Level data input
Pin 6	UART(TXD)TTL Level data output

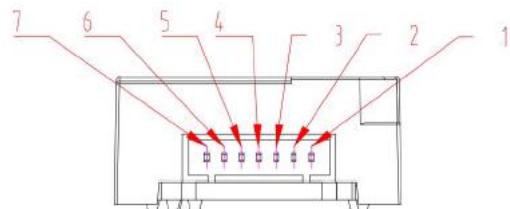


Fig4.Terminal connection version

## Output

### PWM output

Take 400~2000ppm for example

CO2 output range	400~2000ppm
Cycle	1004ms±5%
Cycle start high level output	2ms (theoretical value)
The middle cycle	1000ms±5%

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cycle end low level output	2ms (theoretical value)
CO2 concentration: $C_{ppm} = 2000 \times (TH - 2ms) / (T - 4ms)$	
$C_{ppm}$ : CO2 concentration could be calculated by PWM output	
TH high level output time during cycle	
T output time during cycle(1004ms ±5%)	

## Serial port output (UART)

### Hardware connection

Connect module's Vin-GND-RXD-TXD to users' 5V-GND-TXD-RXD.

(Users must use TTL level. If RS232 level, it must be converted.)

### Software setting

Set serial port baud rate be 9600, data bit 8 bytes, stop bit 1byte, parity bit null.

Commands	
0x86	Read CO2 concentration
0x79	Turn on/off self-calibration function

### 0x86- Read CO2 concentration

#### Sending command

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

#### Return value

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Command	Concentration (High 8 Byte)	Concentration (Low 8 Byte)	-	-	-	-	Checksum

0xFF	0x86	HIGH	LOW	-	-	-	-	Checksum
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**For example: CO2 concentration = HIGH \* 256 + LOW**

How to calculate concentration: convert hexadecimal 01 into decimal 1, hexadecimal F4 into decimal 244, then  $1*256+244=500$ ppm

0x79- On/Off Self-calibration for Zero Point								
Send command-No return value								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Command	-	-	-	-	-	Checksum
0xFF	0x01	0x79	0xA0/0x00	0x00	0x00	0x00	0x00	Checksum
No return value								
NOTE: when byte3 is 0xA0, the auto calibration function is on; when byte3 is 0x00, the auto calibration function is turned off. The sensor factory by default is on self-calibration function.								

Checksum calculation method								
Checksum = (Negative (Byte1+Byte2+Byte3+Byte4+Byte5+Byte6+Byte7))+1								
For example:								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Command	-	-	-	-	-	Checksum
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	Checksum
Calculating Checksum:								
1、Add Byte 1 to Byte 7: $0x01 + 0x86 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 = 0x87$								
2、Negative: $0xFF - 0x87 = 0x78$								
3、Then+1: $0x78 + 0x01 = 0x79$								
C language								
<pre>char getCheckSum(char *packet) {     char i, checksum;     for( i = 1; i &lt; 8; i++)     {         checksum += packet[i];     }     checksum = 0xff - checksum; }</pre>								

## Zero Point Calibration

This module has two methods for zero point calibration: hand-operated method and self-calibration. All the zero point is at 400ppm CO2.

<b>Hand-operated method:</b>
Connect module's HD pin to low level(0V), lasting for 7 seconds at least. Before calibrating the zero point, please ensure that the sensor is stable for more than 20 minutes at 400ppm ambient environment.
<b>Self-calibration:</b>

After the module works for some time, it can judge the zero point intelligently and do the zero calibration automatically. The calibration cycle is every 24 hours since the module is power on. The zero point is 400ppm.

This method is suitable for office and home environment, not suitable for agriculture greenhouse, farm, refrigerator, etc.. If the module is used in latter environment, please turn off this function.

## Notes

- Please avoid the pressure of its gilded plastic chamber from any direction, during welding, installation, and use.
- When placed in small space, the space should be well ventilated, especially for diffusion window.
- To ensure the normal work, the power supply must be among 4.5V~5.5V DC rang, the power current must be not less than 150mA. Out of this range, it will result in the failure of the sensor. (The concentration output is low, or the sensor cannot work normally.)
- The module should be away from heat, and avoid direct sunlight or other heat radiation.
- The module should be calibrated termly, the suggested period is no longer than 6 months.
- Do not use the sensor in the high dusty environment for long time.
- During the zero-point calibration procedure by manual or sending command, the sensor must work in stable gas environment (400ppm) for over 30 minutes.
- Forbid using wave soldering for the sensor.
- When soldering with soldering iron, set the temperature to be (350 ± 5) ° C, and soldering time must be within 3 seconds.