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Winsen 炜盛科技

Infrared CO2 Sensor Module

(Model: MH-Z19C)

User's Manual

(Version 1.0)

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Zhengzhou Winsen Electronics Technology Co., Ltd

ISO9001 Certificated Company

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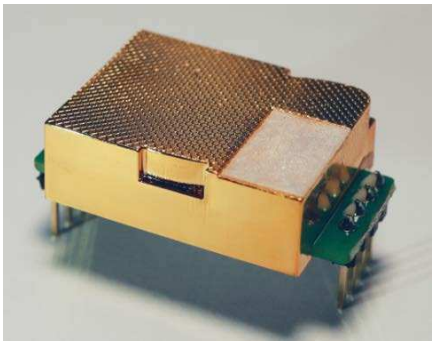
Zhengzhou Winsen Electronics Technology CO., LTD.

MH-Z19C NDIR CO2 Module

Profile

MH-Z19C NDIR infrared gas module is a common type, small size sensor, using non-dispersive infrared (NDIR) principle to detect the existence of CO2 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

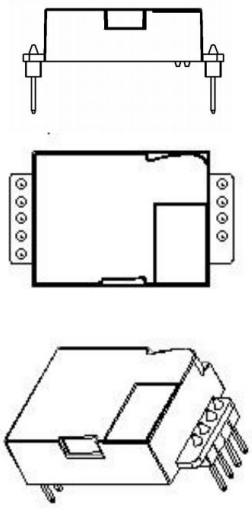
*HVAC refrigeration *Air cleaner device *Indoor air quality monitoring
*Smart home *Ventilation system *School

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

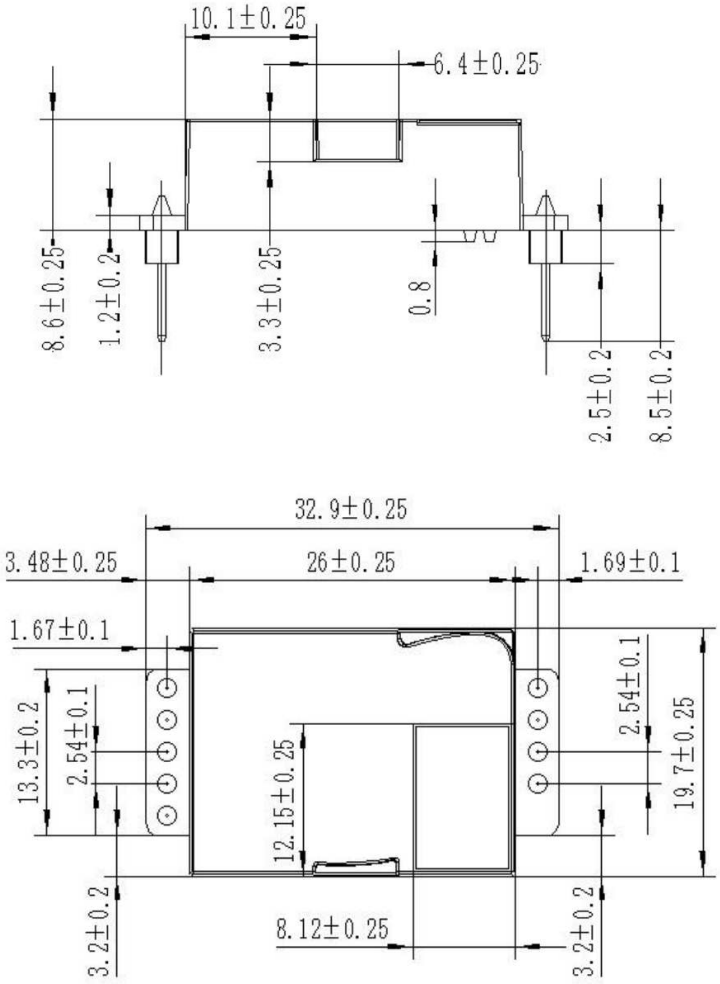
Model No.	MH-Z19C
Detection Gas	CO2
Working voltage	5.0±0.1V DC
Average current	< 40mA (@5V power supply)
Peak current	125mA (@5V power supply)
Interface level	3.3 V (Compatible with 5V)
Detection Range	400~5000ppm(optional)
Output signal	Serial Port (UART) (TTL level 3.3V)
	PWM
Preheat time	1 min
Response Time	T_{90} < 120 s
Working temperature	-10 ~ 50 ℃
Working humidity	0 ~ 95% RH (No condensation)
Weight	5 g
Lifespan	> 5 years



Detection range and accuracy

Detection Gas	Formula	Detection Range	Accuracy
Carbon Dioxide	CO2	400~2000ppm	± (50ppm+5% reading value)
		400~5000ppm	

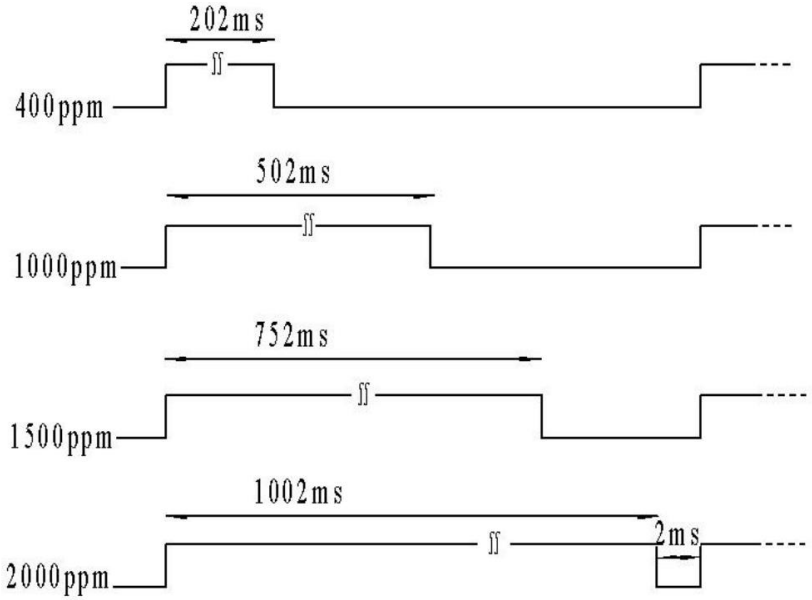
Dimensions



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

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%
cycle end low level output	2ms(theoretical value)
CO2 concentration: Cppm=2000×(TH-2ms)/(TH+TL-4ms)	
C_{ppm}: CO2 concentration could be calculated by PWM output TH high level output time during cycle TL low level output time during cycle	
	

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	ON/OFF Self-calibration function for zero point

0x86- Read CO2 concentration

Sending command

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start Byte	Reserved	Command	-	-	-	-	-	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

CO2 concentration = HIGH * 256 + LOW

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 turned on; when byte3 is 0x00, the auto calibration function is turned off.

The sensor factory default is to enable the automatic zero 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	-	-	-	-	-	Check sum
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	Check sum

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

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

About 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.

Hand-operated method:

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.

Self-calibration function:

The self-calibration function means that after the sensor runs continuously for a period of time, it can intelligently determine the zero point according to the environmental concentration and calibrate itself. The calibration cycle is automatic calibration every 24 hours since power-on operation. The zero point of automatic calibration is 400ppm.

The self-calibration function is suitable for office environment and home environment. However, it is not suitable for agricultural greenhouses, breeding farms, cold storage and other places. In such places, self-calibration function should be turned off. After the shutdown, users are required to periodically perform zero-point detection on the sensors, and if necessary, perform zero calibration or manual zero calibration.

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.

●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 not longer than 6 months.

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

●To ensure the normal work, the power supply must be among 5.0V±0.1V 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 can not work normally.)

●During the zero point calibration procedure by manual, the sensor must work in stable gas environment (400ppm) for over 20 minutes. Connect the HD pin to low level (0V) for over 7 seconds.

●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.

●As for pin version sensor, it is recommended to use soldering socket to directly insert or remove sensors for convenient maintenance.