# 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 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.

**Pins**

**Terminal**
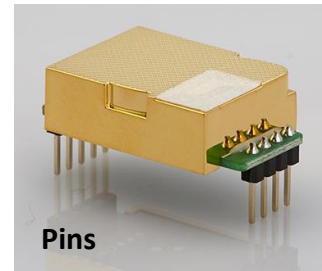
## Applications

*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 | $CO_2$ |
| 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 | $T_{90}$ < 120 s |
| Working temperature | -10 ~ 50 ℃ |
| Working humidity | 0 ~ 95% RH (No condensation) |
| Storage temperature | -20~60 ℃ |
| Weight | 5 g |
| Lifespan | > 10 years |

## Detection range and accuracy

| Detection Gas | Formula | Detection Range | Resolution | Accuracy |
|---|---|---|---|---|
| Carbon Dioxide | $CO_2$ | 400~2000ppm | 1ppm | ± (50ppm+5% reading value) |
| | | 400~5000ppm | | |
| | | 400-10000ppm | | |

## Dimensions(Pins type)
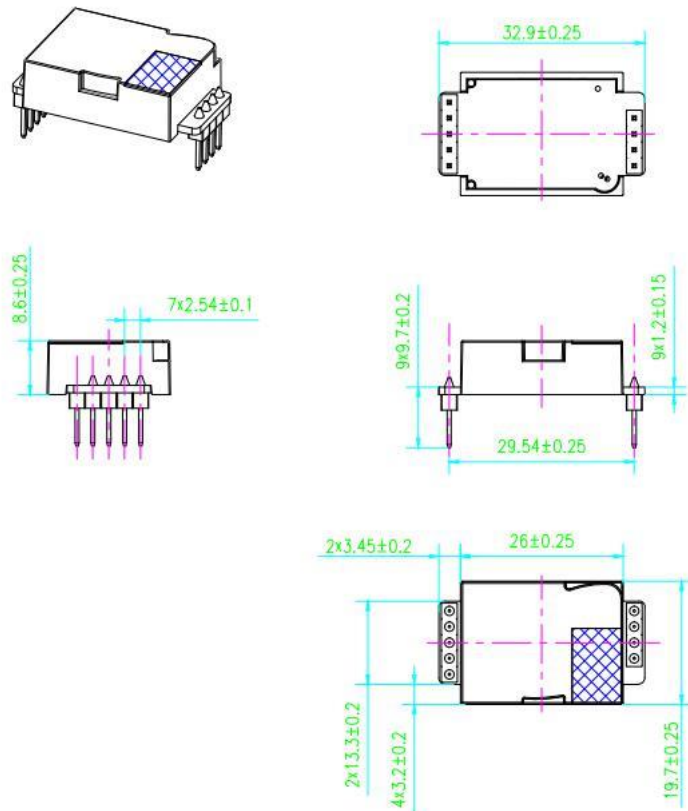


**Pins connection type:**

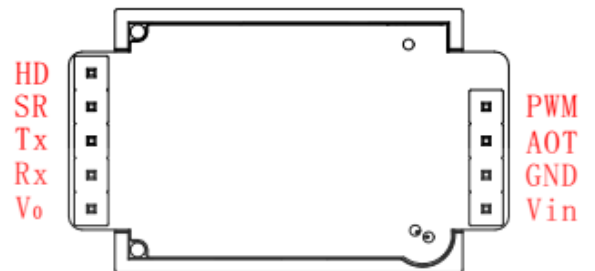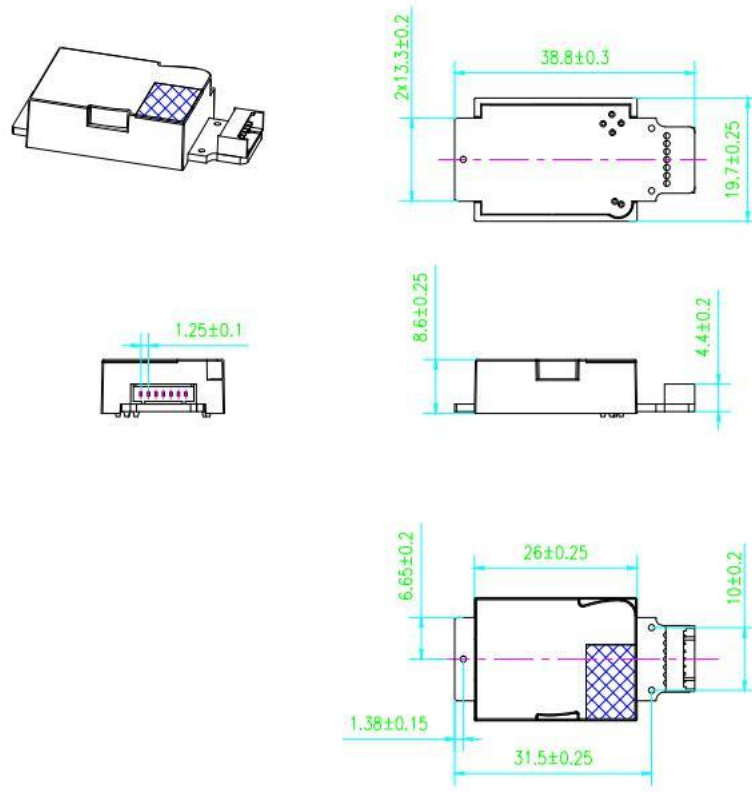| Pin | Pin Definition |
|---|---|
| Vin | Positive pole of power (Vin) |
| GND | Negative pole of power (GND) |
| PWM | PWM |
| Hd | HD(zero point calibration, low level lasting for over 7s is effective) |
| Rx | UART(RXD)TTL Level data input |
| Tx | UART(TXD)TTL Level data output |



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 |

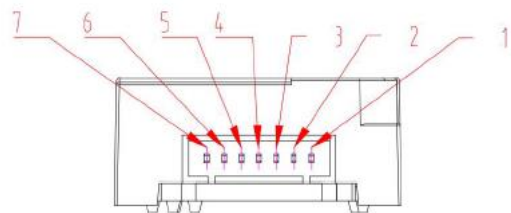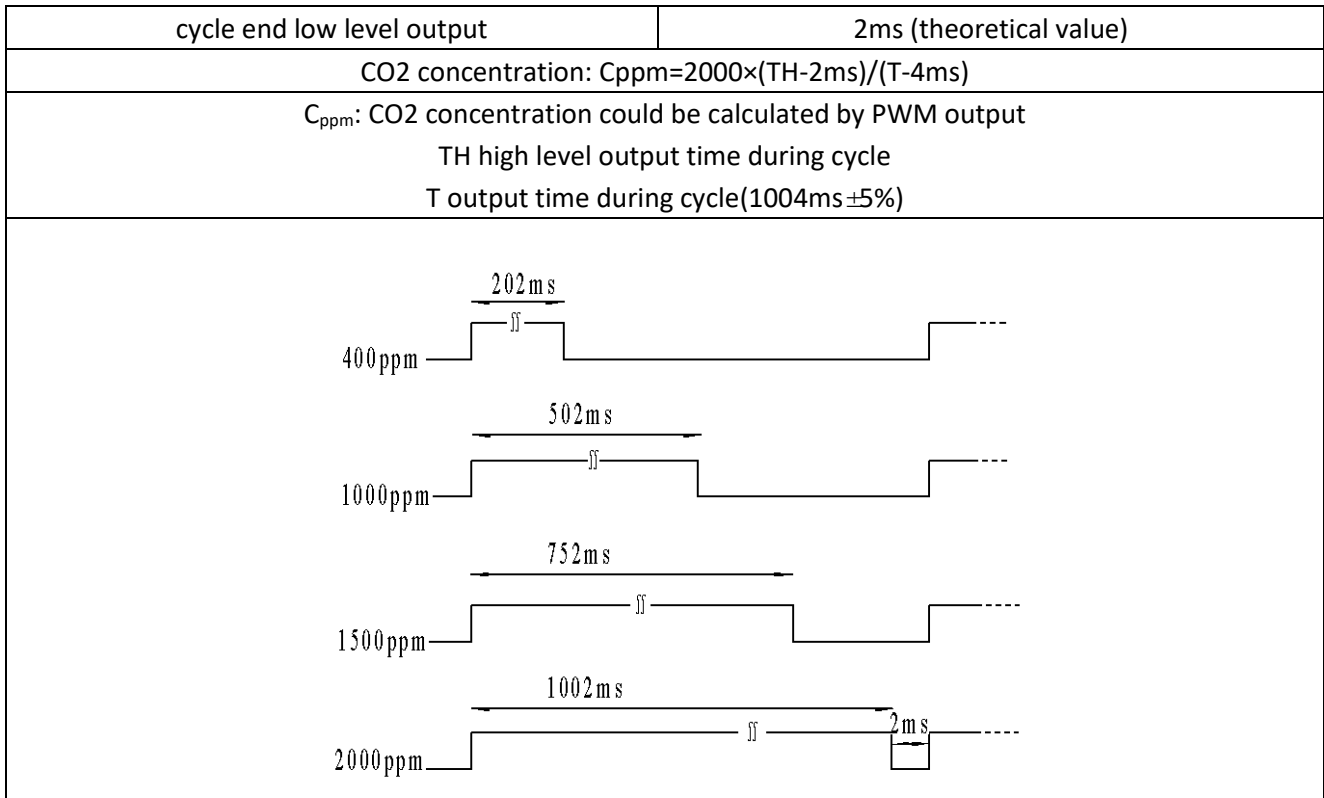**Fig4.Terminal connection version**

## 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% |

| cycle end low level output | 2ms (theoretical value) |
|---|---|
| CO2 concentration: Cppm=2000×(TH-2ms)/(T-4ms) | |
| $C_{ppm}$: CO2 concentration could be calculated by PWM output<br>TH high level output time during cycle<br>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 | 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 |
|------|------|------|-----|---|---|---|---|----------|

**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=500ppm

---

**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**

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

## 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:**

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 $\pm$ 5) ° C, and soldering time must be within 3 seconds.

**ALCYON**
ÉLECTRONIQUE
commercial@alcyonelectronique.fr