

MH-440D NDIR Infrared CH4 Sensor (V2.7)

1. Introduction

MH-440D infrared gas sensor is a miniature universal intelligent sensor, which adopts NDIR theory to detect concentration of CH₄ in air and has good selectivity, stable performance, long life, also is independent of Oxygen. The inside temperature sensor could be used for temperature compensation. This miniature infrared gas sensor is developed by the tight integration of mature infrared absorbing gas detection technology, micro machine workout and superior circuit design.

It is convenient in use and also instead of catalytic component directly, widely used in various occasions with flammable and explosion hazard gas.



2. Features

- High sensitivity, high resolution, low power consumption
- Output method: UART, analog voltage signal
- Temperature compensation, excellent linear output
- Excellent stability, Long lifespan
- Anti-poisons, anti-vapor interference
- Can replace catalytic type gas sensor directly

3. Applications

Widely used for HVAC refrigeration, air monitoring indoor, industrial-process control and safety protection, agriculture and animal husbandry.

4. Main Parameters

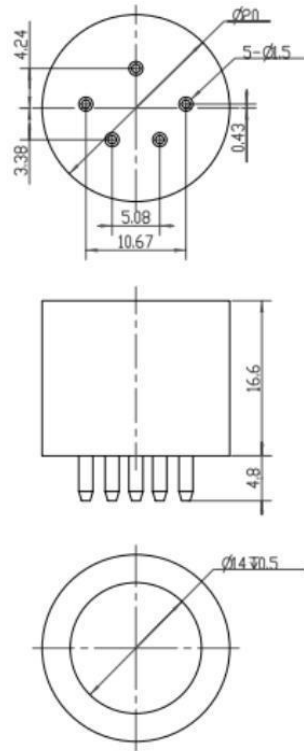
Fig1. Technical Parameters

Detection Gas	Methane (CH ₄)
Working Voltage	3.6~5V DC
Average Current	<85mA
Interface Level	3.0V
Detection range	0~10%vol(selectable, refer fig2.)
Output Signal	UART
	0.4~2V DC
Warm-up time	3 min
Response time	T90<30s
Working Temperature	-20°C ~ 60°C
Working Humidity	0~95%RH(no condensation)
Sizes	Φ 20 × 21.4mm
Weight	35g
Lifetime	>5 years
Defense Grade	IP54

Fig2. Measuring Range and Resolution

Target Gas	Molecular Formula	Measuring Range	Resolution	Note
Methane	CH ₄	0~5%VOL	0.05%VOL	Temperature compensation
		0~10%VOL	0.1%VOL	Temperature compensation

5. Struction Size



■ Pin definition

Pin 2-Vin power supply

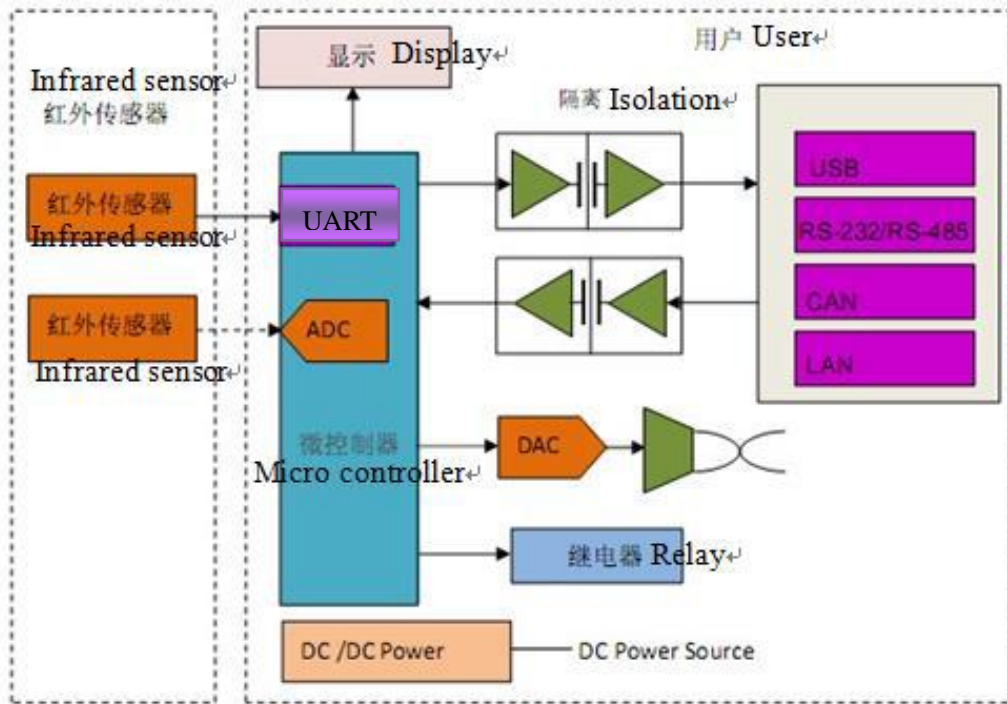
Pin 1-GND

Pin 4-Vout (0.4~2V)

Pin 3-UART (RXD) 0~3.0V data input

Pin 5- UART (TXD) 0~3.0V data output

6.Application circuit



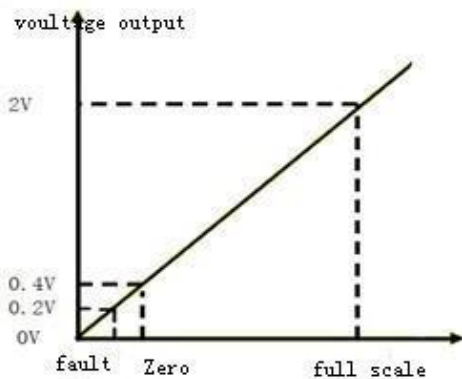
6.1 Analog Output

The output of Vout is proportional to the gas concentration, 0.4-2.0V output stands for 0 to full range.

Connection: Vin -5V, GND- Power Ground, Vout-ADC input.

After warm-up, Vout will show the voltage standing for the gas concentration.

If self-checking detects a fault, the output voltage is 0V.



6.2 Digital Output

Connections: Vin-5V power, GND- Power Ground, RXD - TXD of detector, TXD - RXD of detector.

Users must use TTL level, if you use RS232 level, it must be changed.

Detectors can read gas concentration via UART interface of sensor, no need to calibrate.

6.2.1 UART Communication Protocol

Baud rate: 9600; 8-bit data, 1 stop bit, no calibrating bit

0x86	To read gas concentration value
0x87	To calibrate sensor zero point (ZERO)
0x88	To calibrate span point(SPAN)

0x86-to read gas concentration value:

Send command								
Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79
Returning								
Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Start bit	command	Concentration high-order	Concentration low-order	-	-	-	-	checksum
0xFF	0x86	0x02	0x60	0x47	0x00	0x00	0x00	0xD1

If the detection range is 0~100%LEL CH4, Gas concentration (unit is ppm)=
 [(Changing byte2 value from hexadecimal into decimalism)*256+ (Changing byte3 value from hexadecimal into decimalism)]*500
 If the detection range is 0~5%vol CH4, Gas concentration (unit is ppm)=
 [(Changing byte2 value from hexadecimal into decimalism)*256+ (Changing byte3 value from hexadecimal into decimalism)]*100

0x87-to calibrate zero point

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0xFF	0x01	0x87	0x00	0x00	0x00	0x00	0x00	0x78
No returning								

0x88-to calibrate span point

Send command									
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
Start bit	Sensor no.	Command	Span high-order	Span low-order	-	-	-	-	checksum
0xFF	0x01	0x88	0x07	0xD0	0x00	0x00	0x00	0x00	0xA0
No returning									

Please note: zero calibration must be done before span calibration.

checksum = (negation (byte1+byte2+.....+byte7))+1

For example.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	checksum

Calculation method as follow:

- except byte0, to add all of other bytes
 $0x1 + 0x86 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 = 0x87$
- negate to above value: $0xFF - 0x87 = 0x78$
- add 1 to above value
 $0x78 + 0x01 = 0x79$

Eg.

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

7. Cautions for Maintenance

- 7.1 The sensor should be calibrated regularly. The suggested cycle time is 6 months.
- 7.2 Do not use the sensor in the high dusty environment for long time.
- 7.3 Please use the sensor with correct power supply.
- 7.4 Forbid to weld the sensor pins directly.
- 7.5 Forbid to cut the sensor pins.