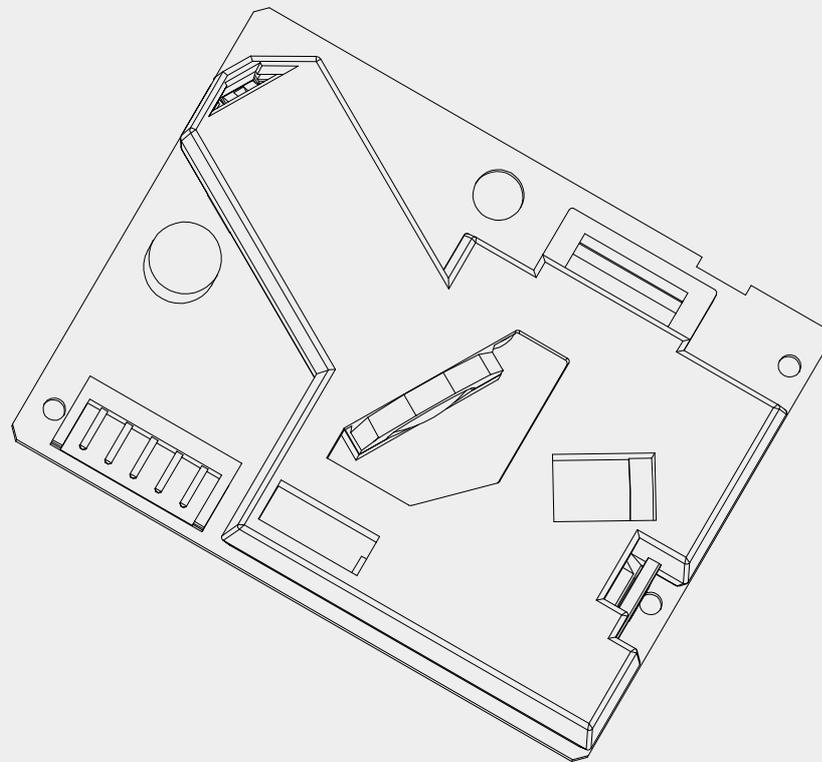


# MPM20-AH

Infrared particulate matter sensor

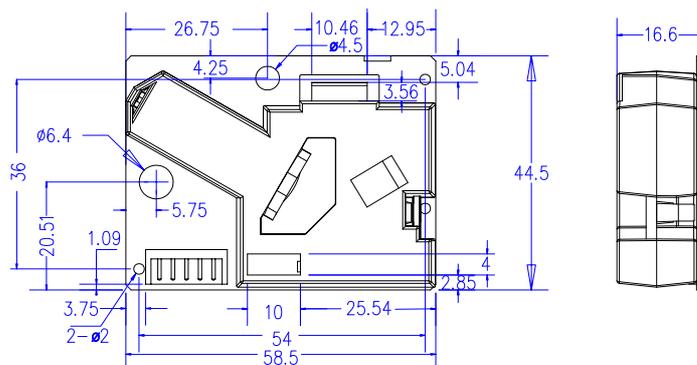
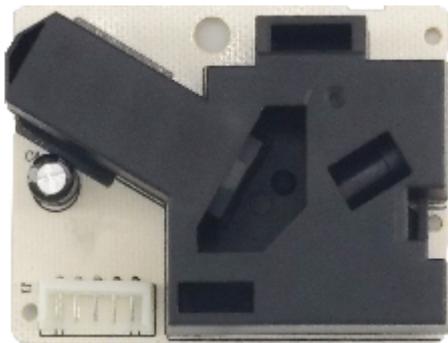


## S P E C I F I C A T I O N

## MPM20-AH

Infrared particulate matter sensor module

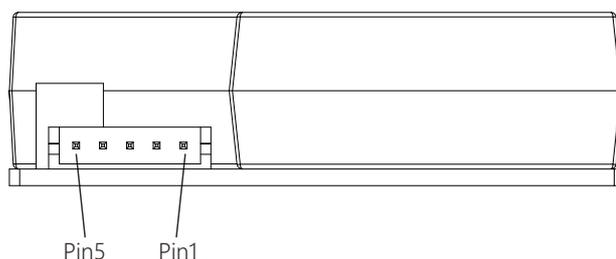
### ◆ Product appearance and size



### ◆ Product Parameter

MPM20-AH	
Working voltage	DC 5V +/-5%; voltage ripple below 50mV
Working current	90mA
Working temperature and humidity	0 ~ 50°C; below 95%rh (no condensation)
Storage temperature	-20 ~ 60°C
Size	59X45X22mm
Weight	26g
Detect particle diameter	About 0.5 μm or bigger
Detection concentration range	0 ~ 500μg/cubic metre
Detecting Consistency Bias (@Voltage 5.0V 25°C 50%RH)	±2.5% (@100~500 μg/cubic metre) ±25 μg/cubic metre (@ 0~100 μg/cubic metre)
Output mode	PWM pulse output or IIC digital interface output
Detection start time	About 1 minute after turning on the power (resistance temperature stabilization time)

### ◆ Pin Diagram

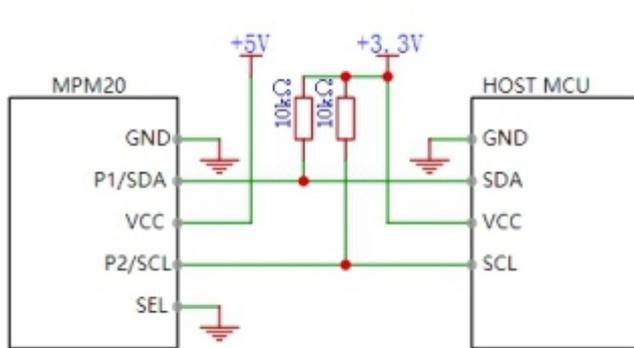


## MPM20-AH

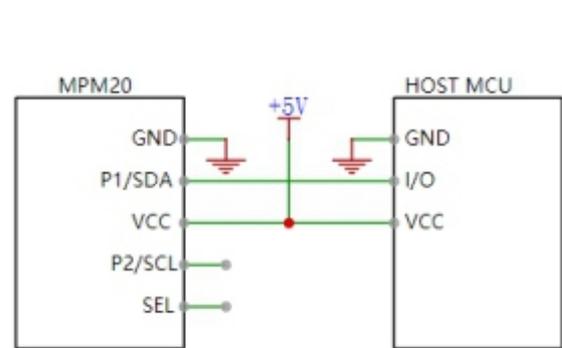
Infrared particulate matter sensor module

pin number	Pin name definition	Pin function description	Pin Electrical Characteristics
Pin 1	GND	negative power supply	No reverse polarity protection
Pin 2	P1/SDA	Average value PWM output pin, or SDA of module IIC interface. Usually connected to the input pin of the customer MCU, or the SDA of the IIC interface	TTL level@3.3V; external pull-up resistor is required when used as IIC function
Pin 3	VCC	Positive power supply (+5V)	No reverse connection protection
Pin 4	P2/SCL	Instantaneous value PWM output pin, or SCL of IIC interface. Usually connected to the input pin of the customer MCU, or the SCL of the IIC interface.	TTL level@3.3V; external pull-up resistor is required when used as IIC function
Pin 5	SEL	PWM/IIC communication mode selection pin. The module detects the level state of this pin within 1 second when it is powered on: it is high level (the pin is externally pulled up or left floating): PWM communication is selected, and Pin2 and Pin4 are used as PWM output pins. Low level (pin connected to GND): select IIC communication, Pin2 and Pin4 are used as IIC communication pins.	Input pin, there is a pull-up resistor connected to VCC

### ◆ circuit connection



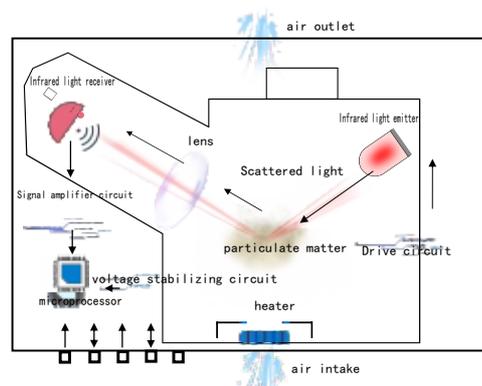
IIC circuit connection diagram



PWM circuit connection diagram

### ◆ Working principle

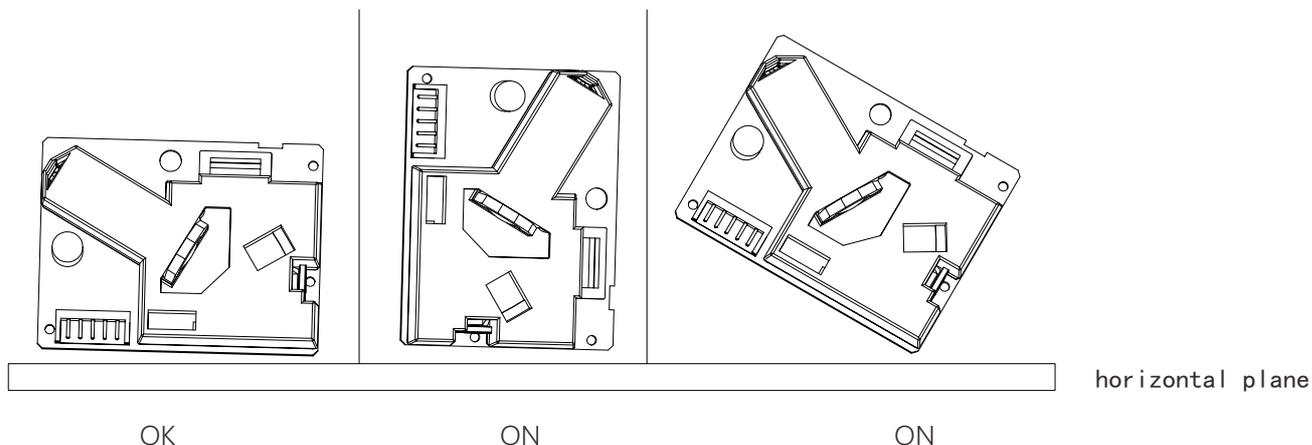
According to the principle of light scattering, the infrared light transmitter is driven by the driving circuit to emit an infrared beam, and the beam is irradiated on the suspended particles in the air to produce scattering. The scattered light is collected by the lens and received by the infrared photoelectric receiver and converted into an electrical signal. The intensity of the electrical signal is proportional to the concentration of the particulate matter, and the concentration of the particulate matter can be determined according to the strength of the signal. The electrical signal is amplified by the signal amplifying circuit and then input to the microprocessor for calculation and processing, and the detection result data is output from the communication interface of the microprocessor.



## MPM20-AH

Infrared particulate matter sensor module

### ◆ Installation methods



### Installation Precautions

1. This module uses the Joule heat of the resistance to heat the air, so as to generate an upward airflow inside the shell, so the module should be installed perpendicular to the ground (error less than  $\pm 5^\circ$ ), and the air inlet of the module should face down (close to the wiring). The terminal is the air inlet), and the air outlet faces upward; ensure the air circulation between the air inlet and the air outlet.
2. External airflow can cause confusion in the airflow inside the module and affect the characteristics of the module. Please consider the airflow around the module.
3. The module is installed inside the device, and the front window needs to be installed with black sponge (the opening surface of the front window cannot have adhesive backing) to ensure that it is in a dark environment and reduce the influence of interfering light.
4. Do not use the module in the environment of organic gas and combustible gas.
5. The module should avoid contact with water mist, which will cause abnormal fluctuations in the module data.
6. Please do not use organic agents and detergents to clean the lens surface. And please do not bruise the surface of the lens, and avoid rubbing against hard objects. The cleaning of the lens surface can be wiped with clean water on a cotton swab, and then wiped with a dry cotton swab. Never use alcohol.

### ◆ interface communication protocol

The interface communication protocol includes IIC communication and PWM communication, which are selected by the SEL pin. The module detects the level state of the SEL pin within 1 second when it is powered on.

For high level (pin external pull-up or floating): select PWM communication, Pin2, Pin4 are used as PWM output pins.

Low level (pin connected to GND): select IIC communication, Pin2 and Pin4 are used as IIC communication pins.

IIC communication:

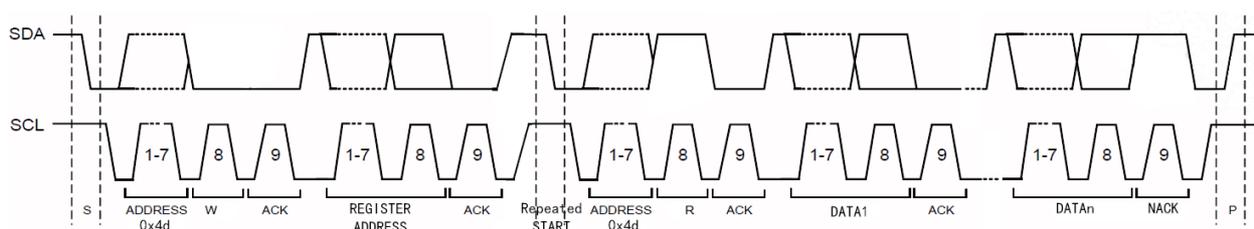
The module works in the slave mode of IIC and can be connected to an external MCU. The communication line needs to be connected with a pull-up resistor.

The slave address of the module device is: 0x4d (7-bit address)

The write operation address of the module is: 0x9a

The read operation address of the module is: 0x9b

When reading the module register data through the IIC interface, the communication timing waveform is as follows:



## MPM20-AH

### Infrared particulate matter sensor module

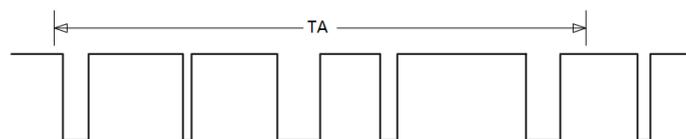
Host sending timing:

- 1: The host sends the IIC start signal;
- 2: Sending module device address 0x4d (7 bits)+W (write bits);
- 3: Send the address of the data register of the module (which address is sent from which register is read, see the IIC register address table);
- 4: Send repeating IIC start signal (note that there is no stop signal here);
- 5: Sending module device address 0x4d (7 bits) + R (read bits);
- 6: The host receives n bytes of data output by the module (when the host receives data, it sends an ACK signal bit to the module. If the host does not send an ACK signal bit, the module stops data transmission).
- 7: The host sends the IIC stop signal.

IIC register address and data format

register address	Function Description
0x20	Firmware version number high byte
0x21	Firmware version number low byte
0x22	Characteristic byte, read as fixed value 0x49
0x23	Module status byte, the bit[0] of this byte is 1, indicating that the read particle concentration value is available. 0 is unavailable. The state of bit[1] of this byte changes (from 0 to 1 or from 1 to 0), indicating that the particle concentration value is updated. Bit[7:2] are reserved bits, and the read value is uncertain.
0x24	The particle concentration value is 8 digits higher (average value)
0x25	The particle concentration value is 8 digits lower (average value)
0x26	The particle concentration value is 8 digits higher (instant value)
0x27	The particle concentration value is 8 digits lower (immediate value)

PWM signal output:



The relationship between PWM conversion to particle concentration:

$$\text{particulate matter concentration (ug/m}^3\text{)} = \text{TL} / \text{TA} * 4000$$

TA is the total sampling time (TA takes 8 to 32 seconds).

TL is the accumulated time of all low pulses within TA time.

### ◆ Version history

date	version	alteration
2022.3.6	1.00	initial version