# MPM30 SERIES
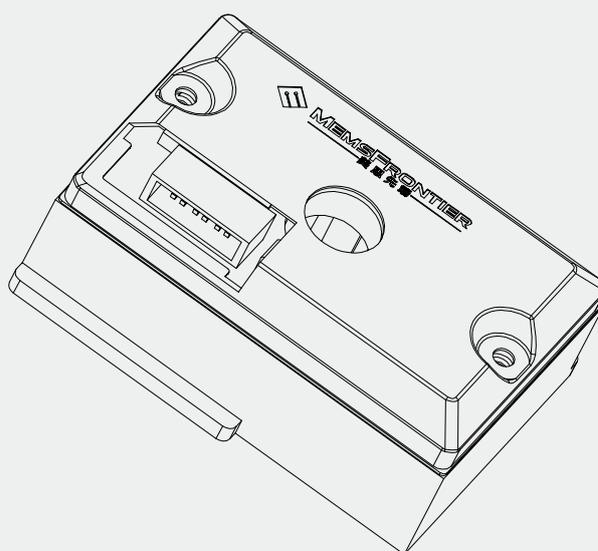
DUST SENSOR MODULE

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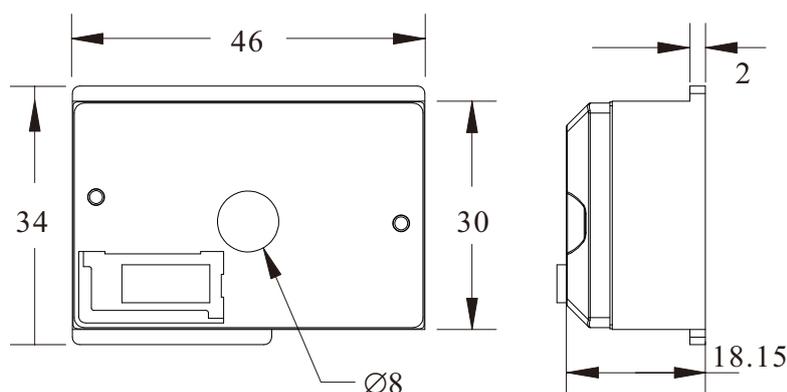
S P E C I F I C A T I O N

## MPM30 SERIES
### DUST SENSOR MODULE

## ◆ APPEARANCE
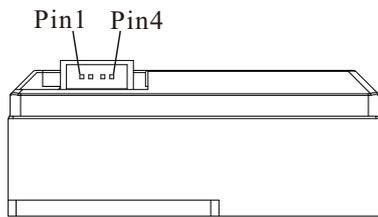


| MPM30-C4 | MPM30-C6 |

## ◆ Product size



## ◆ Product parameters

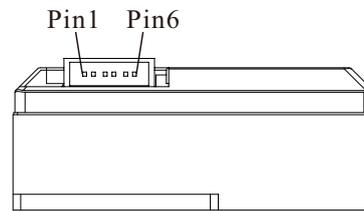| Infrared PM sensor 30 series module | |
|---|---|
| Detection particle diameter | PM0.3~PM10 |
| Detection concentration range | 0~1000μg/m3 |
| Detection accuracy | ±15ug/m³ or ±15% reading (@25±2℃, 50%±10%RH) |
| Power-on settling time | ≤10 s |
| Working voltage | DC 5V±5% , Ripple below 50mV |
| Working current | ≤15mA |
| Output mode | UART/PWM |
| Interface | MPM30-C4: ZH1.5mm-4P socket    MPM30-C6: ZH1.5mm-6P socket |
| Working conditions | -20℃~+75℃,0~95%RH(non-condensing) |
| Storage conditions | -40℃~+85℃,0~95%RH(non-condensing) |
| Lifespan | ≥8 years |
| Dimensions | 46 * 34 * 18.15mm (L×W×H) |

## MPM30 SERIES
### DUST SENSOR MODULE

### ◆ Pin Definition

Pin1  Pin4

MPM30-C4

Pin1  Pin6

MPM30-C6

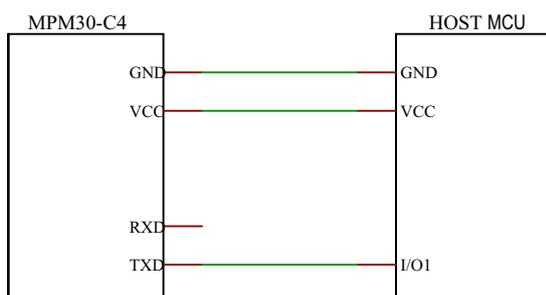| No. | Pin | Description | Electrical characteristics |
|---|---|---|---|
| Pin 1 | GND | Power- | No reverse polarity protection |
| Pin 2 | VCC | Power+(+5V) | |
| Pin 3 | SET | UART baud rate setting pin. The module detects the level state of this pin within 1 second of power-up: if it is high (the pin is externally high or suspended), the UART baud rate is 9600bps.Low (pinged to GND), the UART baud rate is 2400bps. | TTL@3.3V Input (5V Compatible) |
| Pin 4 | PWM | PWM pulse width signal output pin | Open output with an internal pull-up resistor connected to the positive supply |
| Pin 5 | RXD | RXD pin of the module UART interface | TTL@3.3V Input (5V Compatible) |
| Pin 6 | TXD | TXD pin of the module UART interface | Open output with an internal pull-up resistor connected to the positive supply |

### ◆ Circuit connection
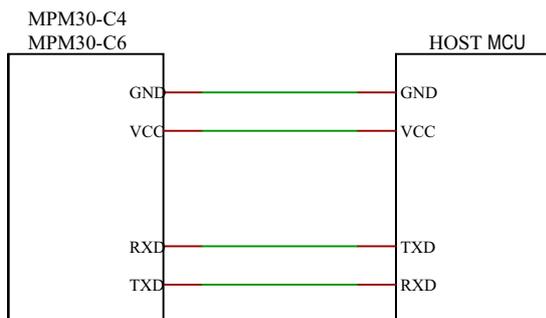
MPM30-C4
MPM30-C6        HOST MCU

GND — GND
VCC — VCC
RXD — TXD
TXD — RXD

UART interface circuit connection (MPM30-C4 /MPM30-C6)

MPM30-C6        HOST MCU

GND — GND
VCC — VCC
SET
PWM
RXD — TXD
TXD — RXD
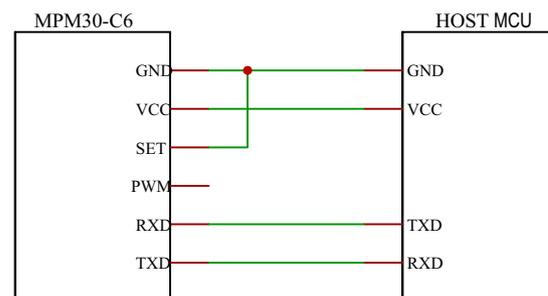
UART interface circuit connection (MPM30-C6 @2400bps)

MPM30-C4        HOST MCU

GND — GND
VCC — VCC
RXD
TXD — I/O1

PWM Output circuit connection (MPM30-C4)

MPM30-C6        HOST MCU

GND — GND
VCC — VCC
SET
PWM — I/O1
RXD
TXD
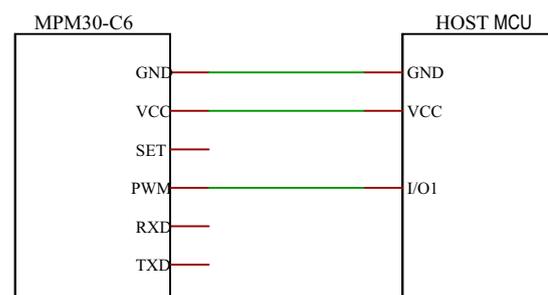
PWM Output circuit connection (MPM30-C6)

## ◆ Detection Principle

According to the principle of optical dispersion,the infrared light emitter is driven by the driving circuit to emit a pulsed infrared beam, the beam is scattered on the suspended particles in the air after the lens is converged, and the scattered light is received by the infrared photoelectric receiver after the lens is converged, converted into an electrical pulse signal, and the intensity of the pulse signal is proportional to the concentration of the particles, and the concentration of the dust can be judged according to the intensity of this pulse signal. The signal is amplified by the amplifier and fed into the microprocessor for calculation and processing, and the detection result data is output from the communication interface of the microprocessor.
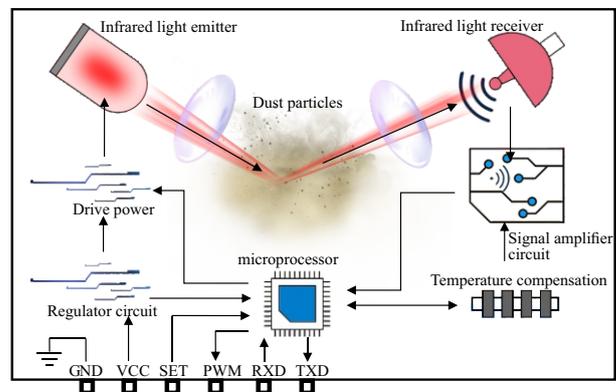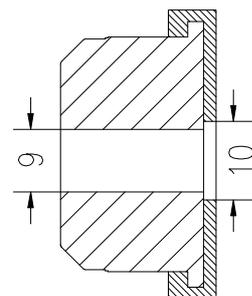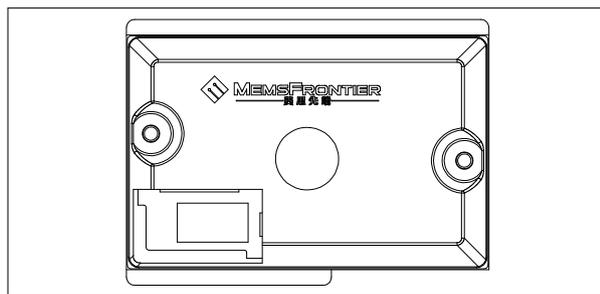


## ◆ Installation Mode

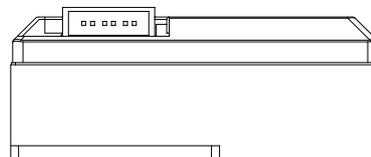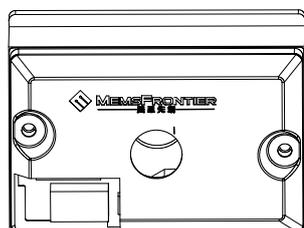**Two mounting options are available:**
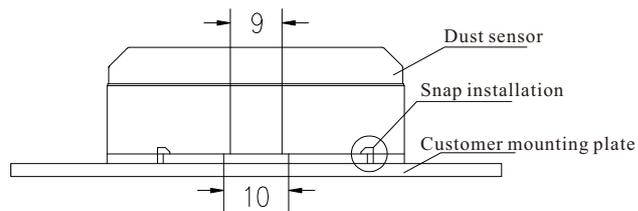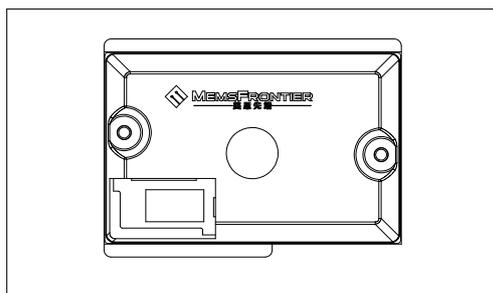


Snap installation



Card slot installation

It is recommended that the module terminals face down when installing;
Note that the vents of the module should have airflow through;

**Recommended installation orientation:**

## ◆ Installation precautions

1. The module should be installed in the position of air circulation to maintain ventilation in the air intake;
2. The module is installed in the backlight as much as possible to prevent external light from entering the module from the ventilation hole, causing the module error to increase;
3. The module housing is of conductive material and is connected to the circuit GND to prevent the module GND pins from being connected to the system above the safety voltage of the human body;
4. Avoid contact with organic solvents and do not use in environments of organic gases and combustible gases;
5. The module avoids contact with water mist, which will cause abnormal fluctuations in the module data;
6. The module is severely shaken and the measurement error will increase;
7. The module is as far away from the high-frequency high-voltage generating source strong electromagnetic environment as possible to prevent interference with the module.

## ◆ Communication Protocol A

Communication protocol A is only available for MPM30-C6. Communication protocol A includes UART serial communication and PWM communication, and the two communication methods can be used at the same time.

**UART serial communication:**

| UART serial port settings | baud rate | Data bits | Stop bit | Checksum | Interface level |
|---|---|---|---|---|---|
| The SET pin is high | 9600bps | 8 bits | 1 bit | N/A | 5V |
| The SET pin is low | 2400bps | 8 bits | 1 bit | N/A | 5V |

The module detects the level state of the SET pin at power-up: if it is high (the pin is externally high or dangling), the UART baud rate is 9600bps. Low (pinged to GND), the UART baud rate is 2400bps.

Serial output is divided into two states: automatic output and passive output. The default state of the module after power-up is automatic output, that is, the module actively sends serial data to the host at an interval of 1sec. The host MCU can send instructions to make the module switch to passive output mode, and when the passive output is initiated by the host MCU, the query module responds to the output data once.

Serial output data format: AA X1 X2 X3 X4 X5 FF

Feature bytes: The 1st byte AA and the last byte FF are fixed values. Data bytes: X1 to X4 total 4 bytes, where X1, X2 are particle measurements, and other bytes are retained. Check byte: X5 is the check byte. A low byte that is the sum of X1 to X4. Data conversion formula: Concentration value = X1×256 + X2 For example, the serial output data is: AA 01 0E 00 00 B9 FF, then the concentration value = 1×256 + 14 = 270 ug/m3

Output Mode Switching Instructions: Switch to Passive Output Mode Instructions: 5A 00 00 00 04 A6 80 01 01 28 Switch to Automatic Output Mode Instructions: 5A 00 00 00 04 A6 80 01 00 27 The module receives an instruction and responds to output data once. After the output mode is changed, the module can be powered down and saved.
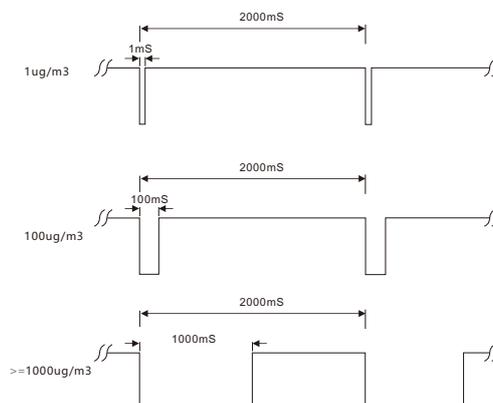
### PWM Communications

The cycle of PWM is 2000ms

PWM range: 1~ 1000 (ug/m3)

RMS potential: Low potential

Minimum low time 1ms

The calculation formula for obtaining the current concentration value by PWM:

Concentration value (ug/m3) = 2000 *(TL)/(TH+TL)

TL is the time in an output cycle when the output is low

TH is the time in an output cycle when the output is high

# ◆ Communication Protocol B

Communication protocol B is only available for MPM30-C4.

Communication protocol B includes UART serial port communication and PWM communication, the two communication methods are enabled in the following ways.

Within 5 seconds after the module is powered on, RXD receives a valid serial port command (such as a host read instruction) and enables the serial port communication mode. If no valid instruction is received within 5 seconds, it is true PWM output mode, where the PWM signal is output from the module's TXD pin.

## Serial communication

| UART serial port settings | baud rate | Data bits | Stop bit | Checksum | Interface level |
|---|---|---|---|---|---|
| | 9600bps | 8bit | 1 bit | N/A | 5V |

In the serial port communication mode, the module does not actively upload data, requiring the host to send data reading instructions, and the module answers the output detection data.

After decoding the serial port data, the particle concentration value is obtained in ug/m3.

Host read instruction: 11 02 0B 01 E1
Module answer data: 16 11 0B X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14 X15 X16

The reply data contains

Feature bytes: The first 3 bytes are fixed values: 16 11 0B.

Data bytes: X1~X15 have a total of 15 bytes, of which X3 and X4 are particle measurements; other bytes are retained.

Check bytes: X16 is the check byte padding. The low byte of the sum of all 19 bytes of the module reply data is 0x00 the validation is successful, not for

0x00, validation fails.

Data conversion formula:
Concentration value = X3×256 + X4
For example, the response data is: 16 11 0B 00 00 01 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 5B
Then, the concentration value = 1×256 + 4 = 260 ug/m3

## PWM Communications

The cycle of PWM is 1000ms
PWM range: 0~992(ug/m3)
RMS potential: Low potential
The start phase outputs 4ms low
The middle period is 992ms
The end phase outputs 4ms high
The calculation formula for obtaining the current concentration value by PWM:
Concentration value (ug/m3) = 1000 *(TL-4ms)/(TH+TL)
TH is the time in an output cycle when the output is high
TL is the time in an output cycle when the output is low

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Add: 16/F, Bldg. #3, Zhongke Mansion, No.1 Hi-Tech S. Rd, Hi-Tech Park South, Shenzhen, Guangdong, 518067 P.R.China
Tel: + 86-755-83289036      Fax: + 86-755-83289052      E-mail: sales@isweek.com
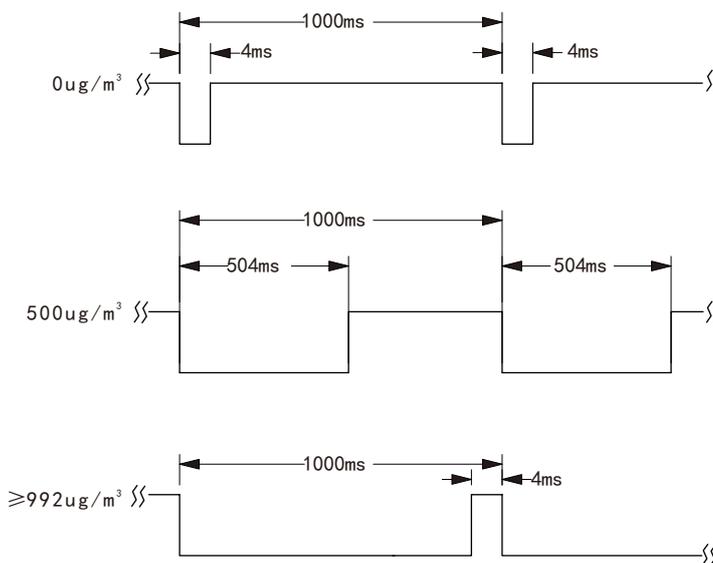
# ◆ Communication protocol C

Communication protocol C is only available for MPM30-C4. Communication protocol C contains UART serial port communication.

### Serial communication

| UART serial port settings | Baud rate | Data bits | Stop bit | Checksum | Interface level |
|---|---|---|---|---|---|
| | 9600bps | 8bit | 1bit | N/A | 5V |

The module is continuous operation by default, the UART serial port automatically uploads the detection data every 1 second, and the host only needs to receive the detection data during the application process, and the received serial port data is decoded to obtain the particle concentration value, the unit is ug/m3.

**The serial port outputs a frame of data consisting of 4 bytes, and the data format is as follows:**

| Characteristic byte | Data byte 1 | Data byte 2 | Check byte |
|---|---|---|---|
| 0xA5 | DATAH | DATAL | SUM |

Characteristic byte: fixed value 0xA5.
Data byte: DATAH is the upper 7 bits of the density value, DATAL is the lower 7 bits of the density value.
Check Byte: The lower 7 bits of the cumulative sum of all bytes before the check byte.

Serial port data conversion formula:
Concentration value = DATAH(bit[6:0])×128 + DATAL(bit[6:0])

For example, the serial port outputs 4 bytes of data: 0xA5 0x01 0x2C 0x52 Then,
 DATAH = 0x01=1 , DATAL= 0x2C =44,
concentration value = 1×128 + 44 = 172 ug/m3

# ◆ Version history

| Date | Version | Update |
|---|---|---|
| 2022.3.29 | 1.00 | Initial version |

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Add: 16/F, Bldg. #3, Zhongke Mansion, No.1 Hi-Tech S. Rd, Hi-Tech Park South, Shenzhen, Guangdong, 518067 P.R.China
Tel: + 86-755-83289036      Fax: + 86-755-83289052      E-mail: sales@isweek.com