Product specification

Name: Multi-in-one gas sensor module

Model: MSM-TPCVF

Version: V1.0

Establishment	Audit	Approve
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1. Features

- The laser scattering principle measures the concentration of particulate matter
- Measurement of formaldehyde and TVOC by electrochemical and semiconductor principles
- Measurement of carbon dioxide by infrared non-spectral principle
- Internal integrated temperature and humidity detection chip
- Highly integrated and convenient for user design

2. Overview

MSM-TPCVF is a multi in one gas sensor module, which can measure multiple gas indicators at the same time. The sensor module is equipped with laser particle sensor, infrared non spectroscopic carbon dioxide sensor, electrochemical formaldehyde sensor and semiconductor TVOC sensor, which are respectively used to obtain particle concentration, carbon dioxide, formaldehyde and TVOC concentration. The sensor module also contains a temperature and humidity sensor chip. Various parameters will be uniformly output in the form of digital interface. By optimizing the sensor layout structure, the sensor module not only ensures that the size of the sensor module is small enough, but also ensures the sensitivity of each sensor.

3. Technical indicators

Table 1-6

Table 1 Technical index of particulate matter concentration

Parameter	Index	Unit
Particulate matter measurement range	0.3~1.0；1.0~2.5；2.5~10	μm
Particulate count efficiency	50%@0.3 μm 98%@>=0.5 μm	
Effective range of particulate mass concentration (PM2.5 standard value)	0~500	μg/m³
Maximum range of particulate mass concentration (PM2.5 standard value) 1	≥1000	μg/m³
Resolution of particulate matter mass concentration	1	μg/m³
Consistency of particulate matter mass concentration (PM2.5 standard value) 2	±10%@100~500 μg/m³ ±10 μg/m³@0~100 μg/m³	

Note 1: The maximum range refers to the maximum output value of PM2.5 standard value ensured by this sensor is not less than 1000 μ g/m3. Above 1000 μ g/m3, the actual measurement shall prevail.

Note 2: The consistency data of particulate matter concentration is measured at 20 ℃ and 50% humidity

Table2 HCHO Concentration technical index

Parameter	Index	Unit
Effective range	0-1	mg/m³
Maximum range	1.3	mg/m³
Resolution	0.01	mg/m³
Detection accuracy	±0.05 mg/m³ or ±13% maximization	

Table3 TVOC Concentration technical index

Parameter	Index	Unit
Effective range	0-65	ppm
	0-65	mg/m³
Resolution	0.01	ppm
	0.01	mg/m³

Table4 CO2 Concentration technical index

Parameter	Index	Unit
Effective range	0~10000	ppm
Maximum range	20000	ppm
Resolution	1	ppm
maximum error	±（50ppm+3%）	

Table 5 Technical indexes of temperature and humidity

Parameter	Index	Unit
Temperature measuring range	-10~+60	℃
Temperature measurement resolution	0.1	℃
Humidity measuring range	0~99	%
Humidity measurement resolution	0.1	%

Table 6 Basic technical index

Parameter	Index	Unit
Single response time	3	Second
Integrated response time	≤30	Second
Dc supply voltage	Typ:5.0 Min:4.8 Max: 5.2	V
Average working current	≤200	mA
Data interface level	L <0.8 @3.3 H >2.7@3.3	V
Operating temperature range	-10~+60	℃
Operating humidity range	0~99%	
Storage temperature range	-40~+80	℃
Mean time to failure	≥3	Years
Size	80*50*18	mm

4. Digital interface definition

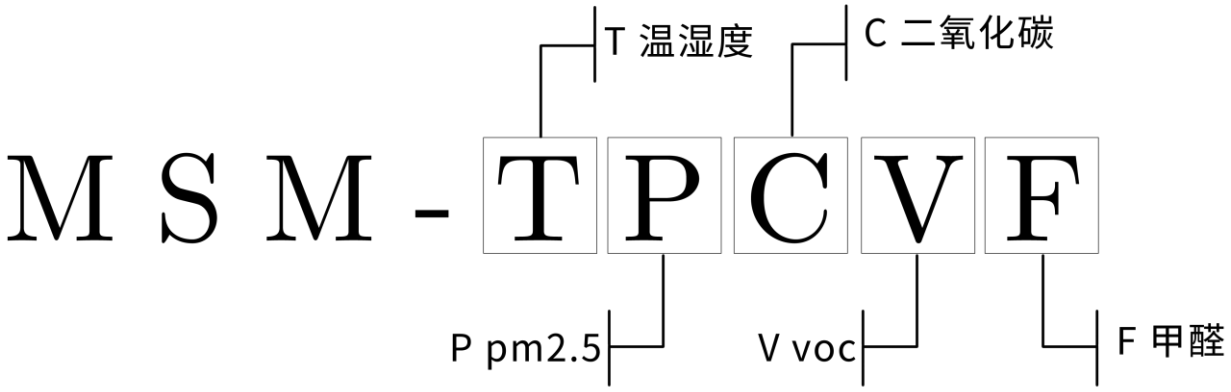
Table 2 Interface diagram

Pin number	Function label	Description
PIN1	VCC	Power positive（+5V）
PIN2	TXD	Serial sending pin /TTL level @5V (built-in pull-up resistance)
PIN3	RXD	Serial port receiving pin /TTL level @5V (built-in pull-up resistance)
PIN4	GND	Negative power

Attention should be paid to circuit design ：

MSM-TPCVF needs 5V power supply, and the power supply ripple should be ≤ 50mV. Because the module has a sensor with optical principle, it is sensitive to the power supply ripple, and excessive ripple will affect the stability and accuracy of the sensor.

5. Model definition



6. Attention

Installation precautions

a) When applied to fresh air purifier products, the sensor should not be directly placed in the air duct of the purifier as far as possible. If it cannot be avoided, an independent structural space should be set up separately, and the sensor should be placed in it to isolate it from the air duct of the purifier. If it is unavoidable, please try to place the air inlet of the sensor in the leeward direction or in the vertical wind direction.

b) When applied to fixed detection equipment, the sensor position shall be more than 20cm above the ground. Otherwise it can be polluted by large dust particles or even flocs near the ground, causing the fan to be wound and stop rotating.

c) When the sensor is applied to outdoor fixed equipment, the protection against sandstorms, rain and snow, willow catkins, etc. shall be completed by the equipment user.

d) The sensor is an integral element, and users should not disassemble it, including the metal shielding shell, to prevent irreversible damage.

Other precautions

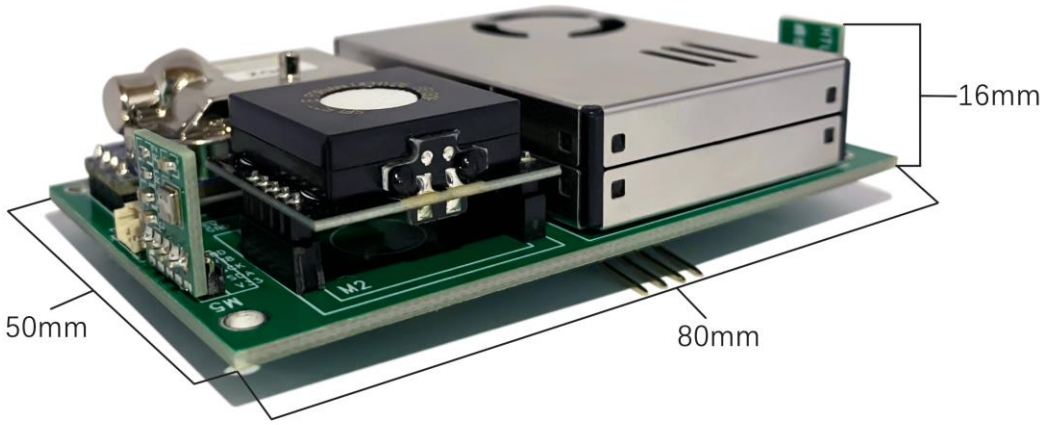
a) The sensor module data ensures the consistency between the factory individuals, and does not take the third-party testing instrument or data as the comparison standard. If the user wants the final measurement results to be consistent with a third-party testing equipment, the user can carry out data fitting according to the actual collected results.

b) This sensor is suitable for ordinary indoor environment. If the device is used in the following environments, protective measures should be applied to the sensor. Otherwise, data consistency may be decreased due to excessive dust, oil, or water accumulation：

- PM2.5 annual dust concentration is greater than 300 MCG/m3 for more than 50% of the time, or greater than 500 MCG/m3 for more than 20% of the time, such as smoking rooms
- Fume environment, such as kitchen
- High water mist environment, such as hot springs, bathrooms
- The local temperature is too high or the sunlight is direct
- outdoors

7. Product appearance dimensions：

（Unit：mm）



weight：50g

8. UART Transport protocol

（UART, 9600 ,N ,8, 1）

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6
42	4D	AC	00	00	01	3B

The last two bytes are the 16bit check code, which is the sum of the first five bytes

Byte	Value	Description
0	0x42	Feature byte 1
1	0x4D	Feature byte 2
2	0x00	Length code height 8-bit
3	0x26	Length code low 8 bits, length code = data segment (n) + check byte (2)
4		The value of PM1.0 (standard particulate matter CF=1) is 8 digits higher
5		PM1.0 (standard particulate CF=1) is 8 digits lower, The unit is ug/m³
6		PM2.5 (standard particulate matter CF=1) was 8 digits higher
7		PM2.5 (standard particulate matter CF=1) is 8 digits lower, The unit is ug/m³
8		The value of PM10 (standard particulate matter CF=1) is 8 digits higher
9		The value of PM10 (standard particulate CF=1) is 8 digits lower, in ug/m³
10		PM1.0 (atmospheric environment) is 8 digits higher

11		PM1.0 (atmospheric environment) value is 8 digits lower, ug/m³
12		PM2.5 (atmospheric environment) is 8 digits higher
13		PM2.5 (atmospheric environment) is 8 digits lower (ug/m³)
14		The value of PM10 (atmospheric environment) is 8 digits higher
15		The value of PM10 (atmospheric environment) is 8 digits lower, in ug/m³
16		The number of particles over 0.3 micron (0.1 liters) was eight higher
17		The number of particles larger than 0.3 micron (0.1 liters) was 8 lower
18		The number of particles larger than 0.5 micron (0.1 liter) was 8 higher
19		The number of particles larger than 0.5 micron (0.1 liters) was 8 lower
20		The number of particles over 1.0 micron (0.1 liter) was 8 higher
21		The number of particles larger than 1.0 micron (0.1 liters) was 8 lower
22		The number of particles over 2.5 microns (0.1 liters) was eight higher
23		The number of particles larger than 2.5 microns (0.1 liters) was 8 lower
24		The number of particles over 5.0 microns (0.1 liters) was 8 higher
25		The number of particles larger than 5.0 microns (0.1 liters) was 8 lower
26		The number of particles over 10.0 microns (0.1 liters) was 8 higher
27		The number of particles over 10.0 microns (0.1 liters) was 8 lower

28		The TVOC value is 8 bits higher
29		The TVOC value is 8 digits lower (unit PPM) Note: Final value = 16-digit hexadecimal number converted to adecimal number /100
30		The TVOC value is 8 bits higher
31		The TVOC value is 8 digits lower, in mg/m³ Note: Final value = 16-digit hexadecimal number converted to adecimal number /100
32		The HCHO value is 8 bits higher
33		The HCHO value is 8 digits lower (mg/m3) Note: Final value = 16-digit hexadecimal number converted to adecimal number /100
34		The CO2 value is 8 digits higher
35		The CO2 value is 8 digits lower (unit PPM)
36		The temperature value is 8 bits higher
37		The temperature value is 8 digits lower. Note: Final value = 16-digit hexadecimal number converted to adecimal number /10
38		The humidity value is 8 digits higher
39		The humidity value is 8 digits lower. Note: Final value = 16-digit hexadecimal number converted to adecimal number /10
40		The check word is 8 bits high
41		Check word lower 8 bits, 16bit check word = Sum of all bytes before the check word itself

Note: Standard particulate matter mass concentration refers to the mass concentration value obtained by density conversion of industrial metal particulate matter as equivalent particle, which is suitable for industrial production workshops and other environments; The mass concentration value of atmospheric particulate matter is converted from the main pollutants in the air as equivalent particles, which is suitable for ordinary indoor and outdoor atmospheric environment.