Winsen
炜盛科技

Laser Dust Module

（Model: ZH03/ZH03A/ZH03B）

Manual

Version: 2.0

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Zhengzhou Winsen Electronics Technology CO., LTD

ZH03 Series Laser Dust Sensor Module

Profile

Laser Dust sensor module is a common type, small size sensor, using laser scattering principle to detect the dust particles in air, with good selectivity and stability. It is easy to use, with serial port output & PWM output. This series products include ZH03,ZH03A and ZH03B.



Features

Good consistency, Real time response

Accurate data, Low power consumption

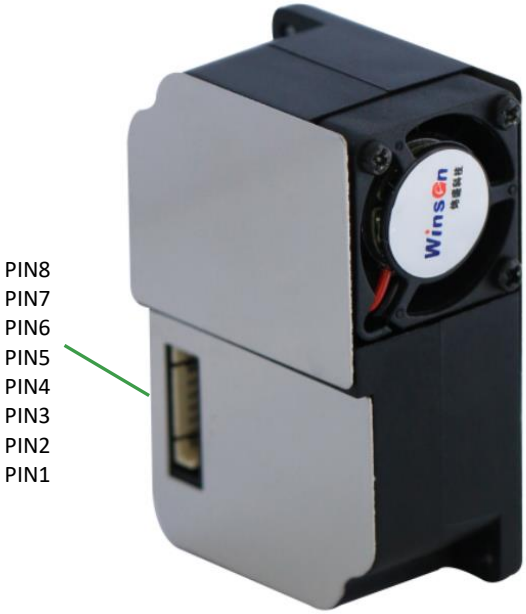
Minus resolution of particle diameter 0.3 μm

Main Applications

It's widely used in air purifiers , ventilation systems , portable instrument, air quality monitoring equipment, air conditioner, and smart home equipment.

Technical Parameters Stable1.

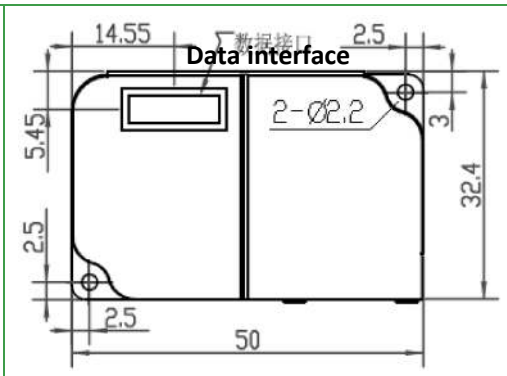
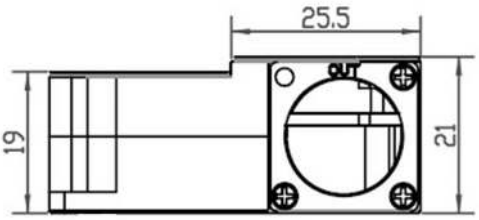
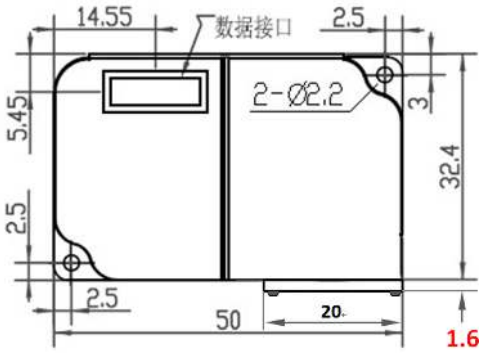
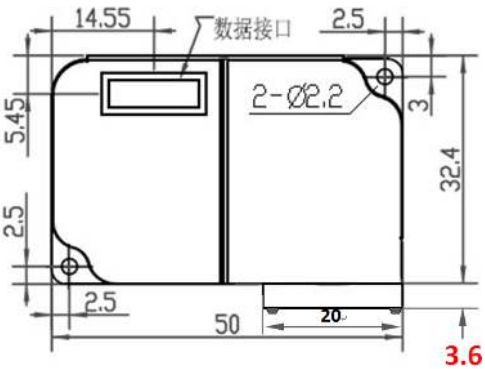
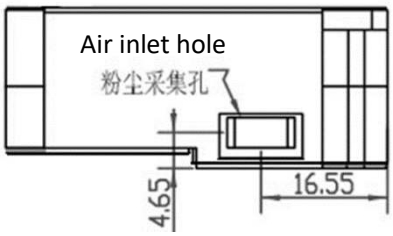
Model	ZH03/ZH03A/ZH03B
Detection Gas	PM1.0, PM2.5, PM10
Output	UART OUTPUT (3V TTL)
	PWM output
Working Voltage	5V±0.1V
Working Current	<120mA
Dormancy current	<10mA
Response Time	T_{90}≤45s
Working Humidity	0~85%RH(no condensation)
Working Temperature	-10~50℃
Storage Temperature	-30~70℃
Life Span	3 years (in air)
Dimension	50x32.4x21mm(LxWxH)



Stable2.

PIN1	VDD	5V±0.1V
PIN2	GND	
PIN3	reserved	
PIN4	RXD Serial receive pin	TTL:0~3V
PIN5	TXD Serial send pin	TTL:0~3V
PIN6	Reserved	hang in air for users
PIN7	reserved	
PIN8	PWM output	TTL:0~3V

Sensor construction：

ZH03		
ZH03A		
ZH03B		

Installation way:

Air inlet hole need good ventilation. The fan is at the place of air outlet. When the module is installed or used, please avoid strong air flow; if the strong air flow can’t be avoided, please make the outside flow direction is vertical to inside flow direction.

Communication Protocol

1. General Settings

Baud rate	9600
Date byte	8 byte
Stop byte	1byte
Check byte	no

2. Initiative upload

Byte 1	Start byte 1		0x42
Byte 2	Start byte 2		0x4D
Byte 3	Frame length	high level 8	0x00
Byte 4		low level 8	0x14
Byte 5	Data 1	High Level 8	Reserved
Byte 6		Low Level 8	
Byte 7	Data 2	High Level 8	Reserved
Byte 8		Low Level 8	
Byte 9	Data 3	High Level 8	Reserved
Byte 10		Low Level 8	
Byte 11	Data 4	High Level 8	PM1.0 concentration
Byte 12		Low Level 8	(atmospheric environment)
Byte 13	Data 5	High Level 8	PM2.5 concentration
Byte 14		Low Level 8	(atmospheric environment)
Byte 15	Data 6	High Level 8	PM10 concentration
Byte 16		Low Level 8	(atmospheric environment)
Byte 17	Data 7	High Level 8	reserved
Byte 18		Low Level 8	
Byte 19	Data 8	High Level 8	reserved
Byte 20		Low Level 8	
Byte 21	Data 9	High Level 8	reserved
Byte 22		Low Level 8	
Byte 23	Check	High Level 8	Initiative upload check=
Byte 24		Low Level 8	= byte1+……+byte 22

NOTE:

1. The default communication mode is initiative upload, the concentration data of PM2.5 after power on for 10 seconds is the version number
2. Calculate method:

   Data frames: 42 4D 00 14 00 54 00 6E 00 7C 00 54 00 6E 00 7C 00 00 00 00 00 00 03 1F

   Check value=

   0x42+0x4D+0x00+0x14+0x00+0x54+0x00+0x6E+0x00+0x7C+0x00+0x54+0x00+0x6E+0x00
   +0x7C+0x00+0x00+0x00+0x00+0x00+0x00 = 0x031F

   0x03 inHigh 8 level is in 23 byte of data frame, 0x1F is in 24 byte of data frame.

3. Question & answer mode

User sends instructions:

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	command	reserve	reserve	reserve	reserve	reserve	Check value
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Return value as follow:

0	1	2	3	4①	5①	6①	7①	8
Starting byte	Command	PM2.5		PM10		PM1.0		
		High 8 Level (ug/m^3)	Low 8 Level (ug/m^3)	High 8 Level (ug/m^3)	Low 8 Level (ug/m^3)	High 8 Level (ug/m^3)	Low 8 Level (ug/m^3)	Check value
0xFF	0x86	0x00	0x85	0x00	0x96	0x00	0x65	0xFA

NOTE:

1. The mark of "①" for PM1.0 and PM10 is valid from V1.41 version, is invalid for previous version.
2.The calculate method for check value of data frames is different in different modes.

4. Switch between Q&A mode and Initiative upload mode

User sends instructions: set Q&A mode:

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	command	Q&A	Reserve	Reserve	Reserve	Reserve	Check value
0XFF	0x01	0x78	0x41	0x00	0x00	0x00	0x00	0x46

User sends instructions : Set initiative upload mode

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	Command	Upload	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0x01	0x78	0x40	0x00	0x00	0x00	0x00	0x47

5. Dormant mode.

User sends instructions: set Q&A mode:

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	Main command	Command to be dormant	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0x01	0xA7	Enter:0x01	0x00	0x00	0x00	0x00	0x57
			Quit:0x00					0x58

Return value as follow:

0	1	2	3	4	5	6	7	8
Starting byte	Main command	Return	Reserve	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0xA7	Successful：0x01	0x00	0x00	0x00	0x00	0x00	0x58
		Failture:0x00						0x59

说明：

1. 注②，该条指令在软件版本 V1.41 之前无效，从 V1.41 版开始实施；
2. 数据帧校验值计算请参考示例代码；

NOTE:

The command with mark "②" is valid from V1.41 version, is invalid for previous version.

Calculate method for check value:

In Q&A mode, the return value is "**FF 86 00 47 00 C7 03 0F 5A**"

Check value== 0x86 + 0x00 + 0x47 + 0x00 + 0xC7 + 0x03 + 0x0F

= 0xA6（keep low 8 level）

= 0x59（positive）

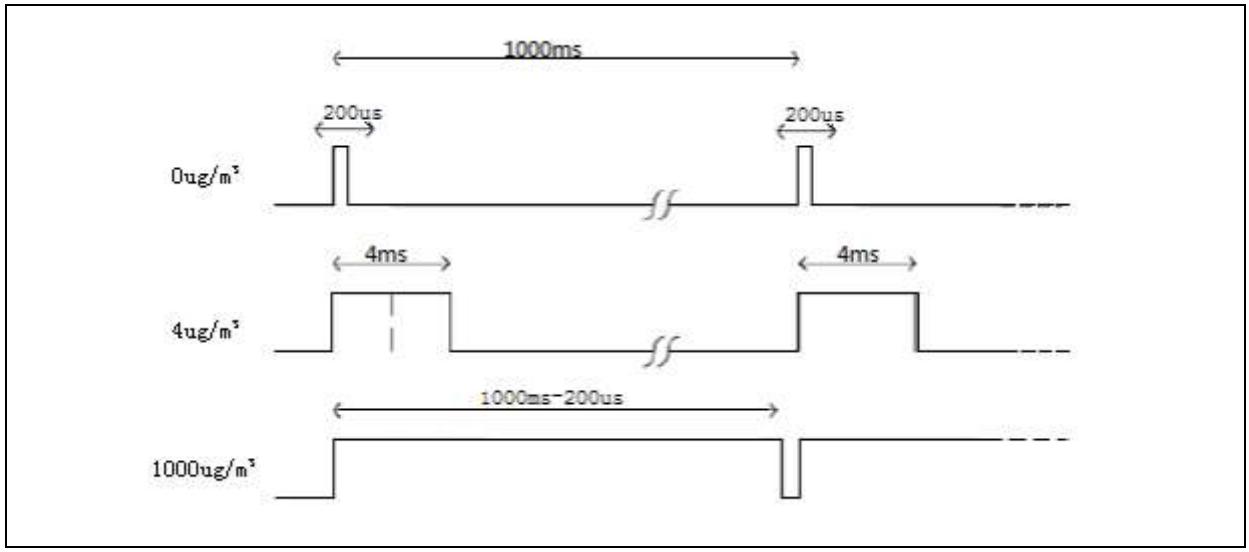
= 0x5A（plus 1）

Eg of code:

```
unsigned char FucCheckSum(unsigned char *i, unsigned char ln)
{
    unsigned char j,tempq=0;
    i+=1;
    for(j=0;j<(ln-2);j++)
    {
        tempq+=*i;
        i++;
    }
    tempq=(~tempq)+1;
    return(tempq);
 }
```

PWM output way

PWM output way	
detection range is 0-1000ug/m^3	
PM2.5 concentration output range	0-1000ug/m^3
Period	1000ms±5%
High level output at the period start	200us(theoretical value)
Middle of the period	1000ms±5%
Low level output at the period end	200us (theoretical value)
To calculate PM2.5 through PMW: P (ug/m^3)=1000x(TH)/(TH+TL)	
P (ug/m^3) is calculated value of PM2.5 concentration, its unit is ug/m^3 TH is the time of high level during one period TL is the time of low level during one period	



Cautions:

1. Do not change or displace any electronic components.
2. Please avoid heavy shock and vibration
3. The sensor should be vertical installed, to extend fan's lifespan.
4. Make sure that the air circulation of dust collecting holes is normal when installation.
5. Please avoid sticky particles into the sensor to affect the sensor's performance.

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