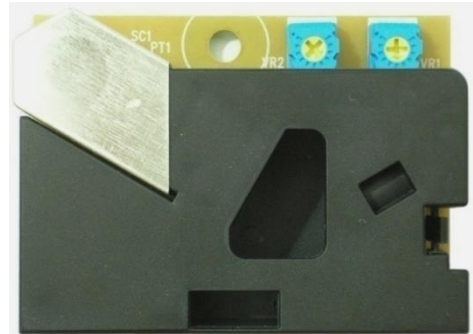# Particle / Dust Sensor Module
DSM 501 Series

1. Features

♦ **Detecting dust, pollen, and particles down 1μm**

♦ **Customized sensitivity for efficient control depending on application**

♦ **Excellent long term reliability and easy maintenance**

♦ **Compact Size**

♦ **PWM Output**

2. Applications

♦ **Air cleaners, Air conditioners**

♦ **Ventilation System, Fan Control**

♦ **IAQ Monitoring & Control**

♦ **Smoke Detectors**

3. Description

DSM 501 is an sensor module which can detects dust concentration.

Dust sensor detects fine particle as small as 1μm and measures quantity of floating particles in a room space up to maximum 30m^3.

The sensor generates forced inflow of the sampling air, and measures the dispersion of reflected lights by particles.

This measurement is then converted to PWM output signal.

The sensor is capable of detecting particles as small as 1μm size particles including house dust, pollen, mite, germ, and cigarette smoke that are known causes for respiratory disease and allergy.

DSM 501 dust sensor is an ideal and cost efficient solution for automatic control of air conditioner and air cleaner as well as monitoring indoor air quality.

4. Operating Condition

Parameter	Symbol	Min.	Typ	Max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Current Consumption	I_{CC}			90	mA
Storage Temperature Range	T_{stg}	-20		80	℃
Operating Temperature Range	T_a	-10		65	℃
Operating Humidity Range (Without dew condensation)	RH			95	%RH
Detectable particle size		1			μm
Detectable range of concentration		0		15,000	pcs/283㎖
Output signal	PWM (Pulse Width Modulation)				
Weight	25g				
Size	(W) 59 mm x (H) 45 mm x (D) 17 mm				

5. Dust sensor output characteristics

Vcc = 5V, Ta = 25℃

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Vout 1, 2 at high [*1]	Voh	No particle	4.0	4.3	-	V
Vout 1, 2 at low [*2]	Vol	Particle	-	0.7	1.0	V
Time for stabilization [*3]			1	-		minute

*1 : Vout 1 and Vout 2 are high state when particles are not detected. (=clean room)

*2 : Vout 1 and 2 go to low state when particles are detected.

*3 : After the power is turned on.
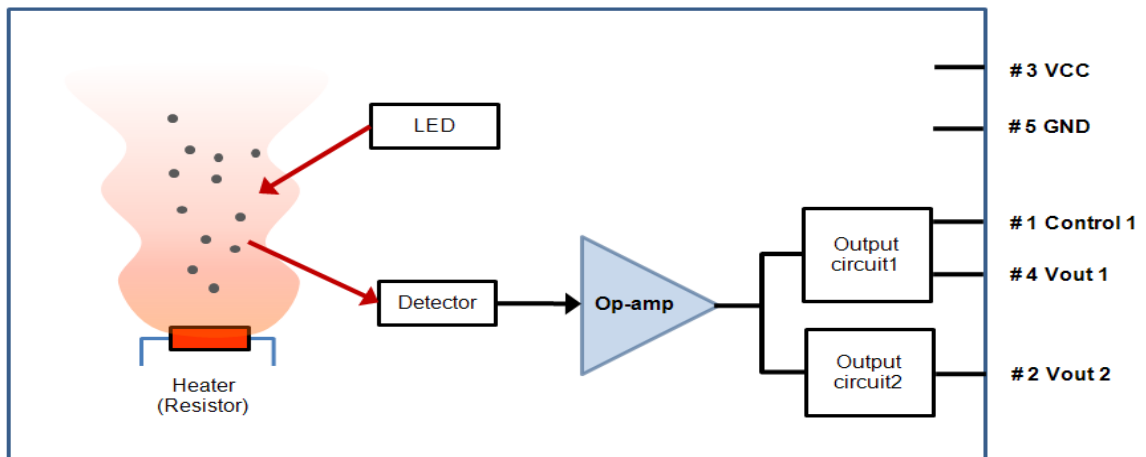
6. Block Diagram

Fig.1 Block Diagram

According to the above Block Diagram, in the inside of sensor module, there are dust detection for infrared LED, Photo TR for scattered infrared signal by external dust, OP-Amp for signal amplification.

The principle of dust detection is that inflowed dust is passed by the measuring scope through upstream due to self-heating of heater, and lights from LED is spawned by dust and is realized as a signal at Detector.

The signal from Detector is displayed to PWM signal through amplification and filtering.

7. I / O Connector Specifications

Pin number	Pin name	Description
1	Control	Vout 1 control
2	Vout 2	Vout 2 output (PWM)
3	Vcc	DC 5 V Input
4	Vout 1	Vout 1 output (PWM)
5	GND	Ground

7-1. PIN Description

Control (Pin #1)

This Pin is used to control that Dust sizes are detected when Vout 1 is being used.

In case of not using this Pin, the Dust size of Vout1's Detecting range is over $2.5\mu m$.

The controllable range is between $2.5\mu m$ and $1\mu m$, and it can be use to connect with Pull Down Resistance.

Vout 2 (Pin #2)

Pin #2 is shows signal by PWM (Pulse Width Modulation) after detecting Dust over $1 \mu m$.
Refer to the 'Page.7' or attached 'Application Note' about the method of signal conditioning.

Vcc (Pin #3)

The Pin of DC 5V input Power. For the stable operation, the power supply range adjust within $\pm 10\%$, Ripple has to be 30mV.

Vout 1 (Pin #4)

This Pin is shows PWM (Pulse Width Modulation) signal after detecting over $2.5 \mu m$ of Dust.
Refer to the 'Page.6' or attached 'Application Note' about the method of signal conditioning.

GND (Pin #5)

Pin #5 is used for Ground.

7-2. Connector Description

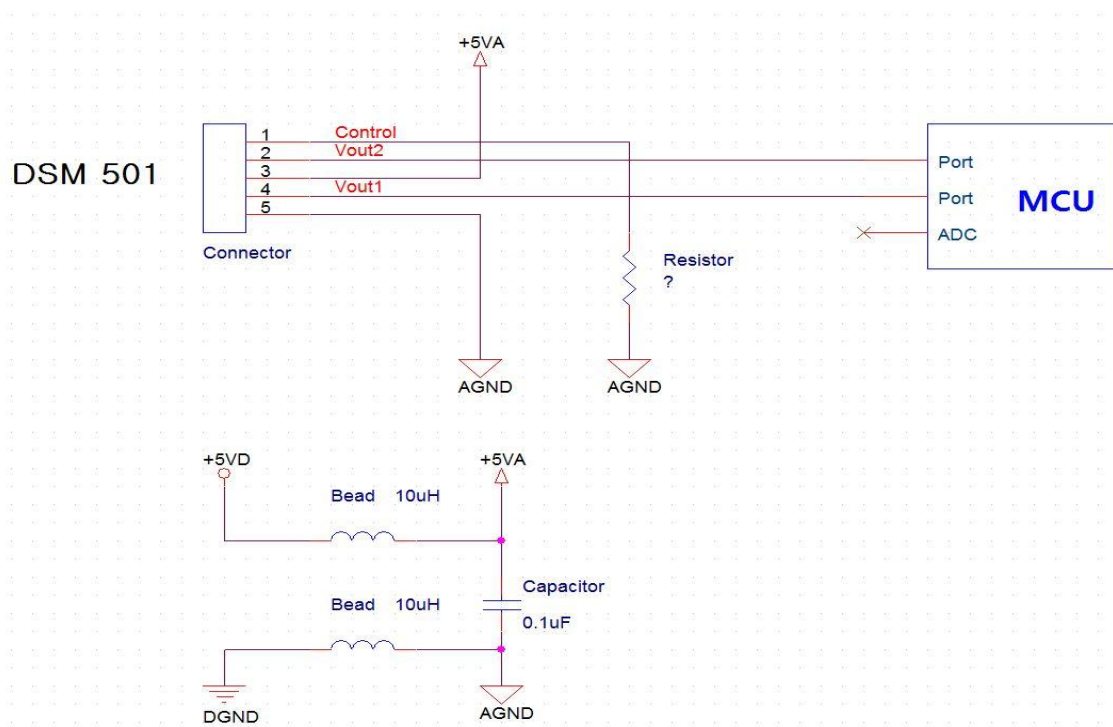| Model name	Part No.		Description	Connector's maker
DSM501A	Wafer	20010WR-05	2mm pitch	Yeonho Electronic
	Housing	20010HS-05		
DSM501B	Wafer	S 5B-EH	2.5mm pitch	J.S.T.
	Housing	EHR-5		

7-3. Sample Schematics

Fig.2 Sample Schematic

8. Detection Size Determination

Size of the signal from the sensor differs depending on the size of the particles detected; over 1um (Vout2) and over 2.5um (Vout1).

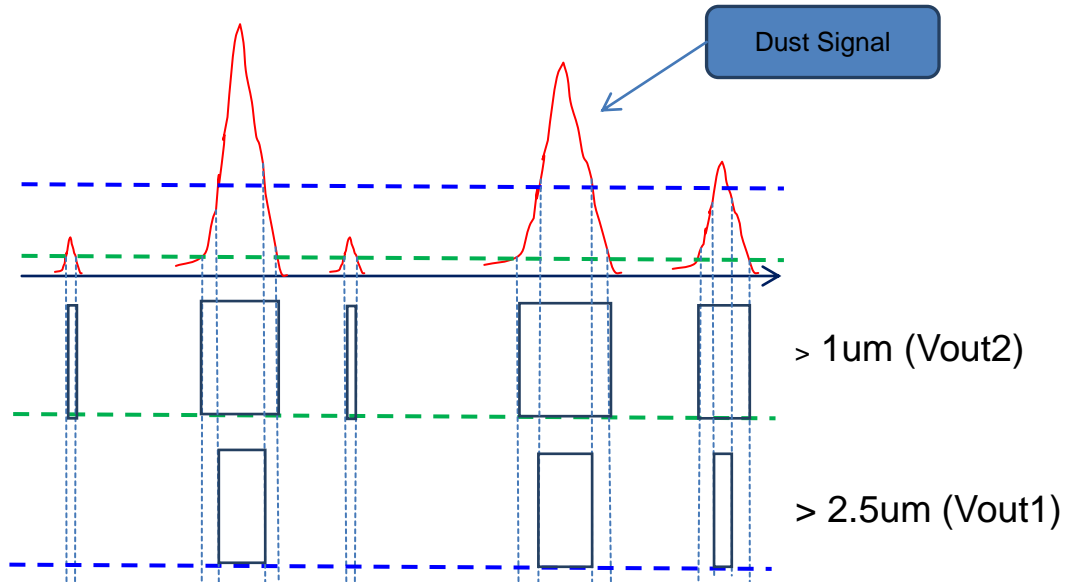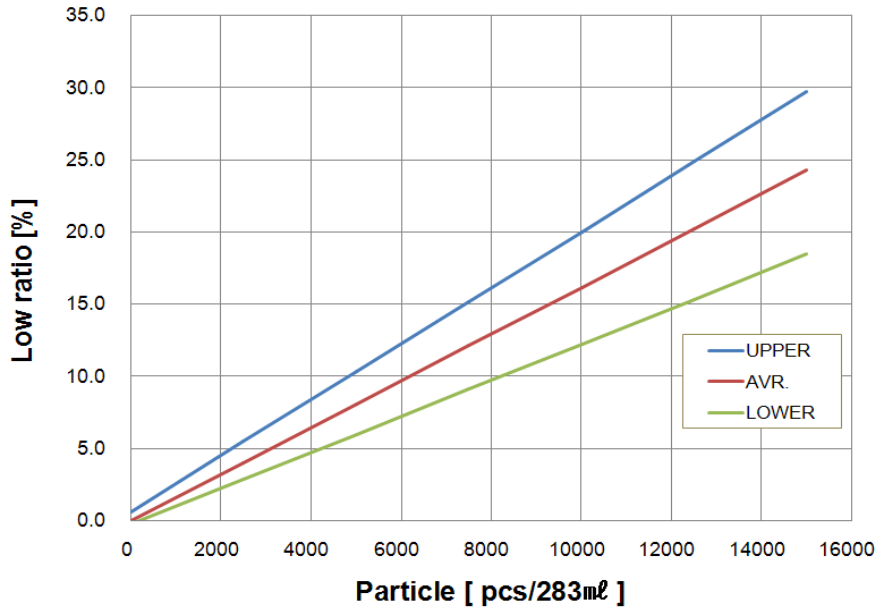Fig.3 Detection Size Determination

9. Sensor Characteristics vs Low ratio

9-1. Dust sensor Characteristics

※ 1 ft^3 = 28316.85ml = 0.02831685m^3

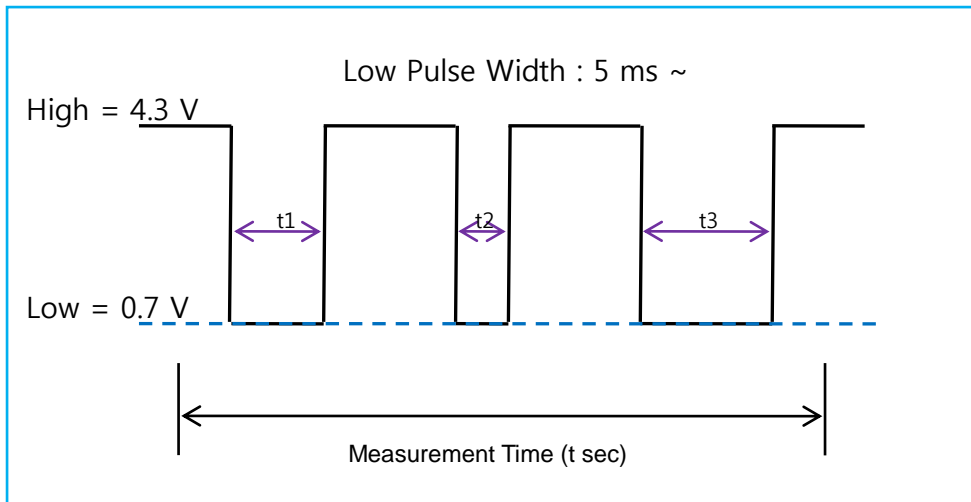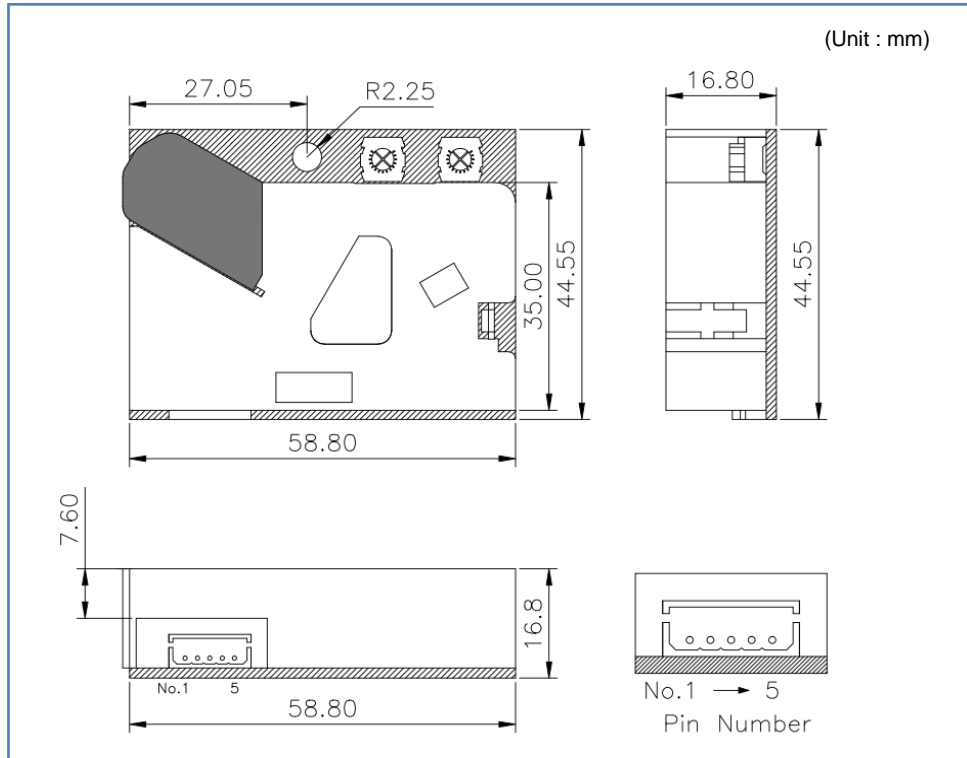Fig.4 Sensitivity Characteristics of Dust sensor

9-2. Low Ratio Calculation

Fig.5 Dust sensor Low Ratio

Low Ratio (%) = (t1 + t2 + t3) / t x 100
(Measurement Time is calculated by a percentage of sum of Low signals occurred within t(5~30) seconds)

10. Dimension

(Unit : mm)
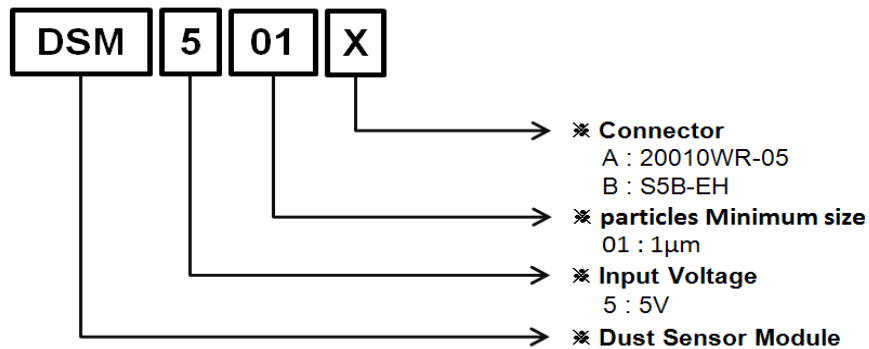
Fig.6 Dimension

11. Ordering Information

Fig.7 Ordering Information

12. Packaging Information

12-1. Marking

Model no.	DSM501A or DSM501B
Qt'y	00 pcs

12-2. Packaging Details

Module dimensions   : W59 x H45 x D17 mm

Weight   : Approx. 25g / ea

Tray   : modules of 25pcs.(5x5) per tray

Outer box   : 10 trays per box (module 250pcs)

Outer Box Dimensions   : W380 x H255 x D320mm

Weight   : Max. 7.5Kg per outer box

Caution for Use

VR trimmer for sensitivity adjustment is set up at shipping from Samyoung S&C.
Please do not touch the VR trimmer.
Please do not disassemble the device. If the device is reassembled, it may not satisfy the specification.
If the device is used in heavily smoked or dusted environment, more frequent cleaning of the lens and maintenance such as vacuuming or air blowing is recommended.

Please **never use** this device for **Emergency** or **Fire alarm** application.

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