

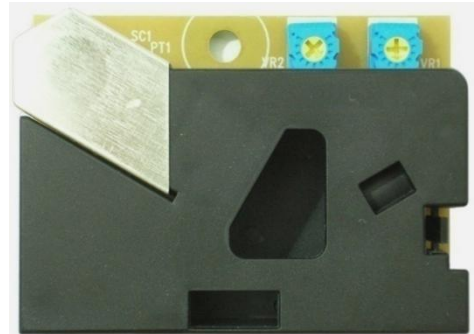


# Particle / Dust Sensor Module

## DSM 501 Series

### 1. Features

- ◆ Detecting dust, pollen, and particles down  $1\mu\text{m}$
- ◆ 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  $1\mu\text{m}$  and measures quantity of floating particles in a room space up to maximum  $30\text{m}^3$ .

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  $1\mu\text{m}$  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	°C
Operating Temperature Range	$T_a$	-10		65	°C
Operating Humidity Range (Without dew condensation)	RH			95	%RH
Detectable particle size		1			$\mu m$
Detectable range of concentration		0		15,000	pcs/283ml
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

$V_{CC} = 5V$ ,  $T_a = 25^\circ C$

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

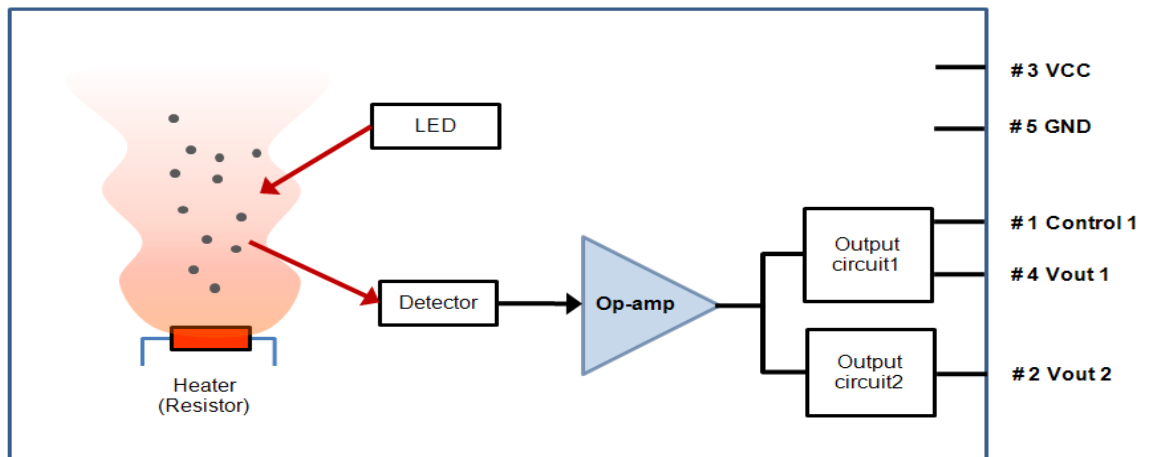


Fig.1 Block Diagram

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

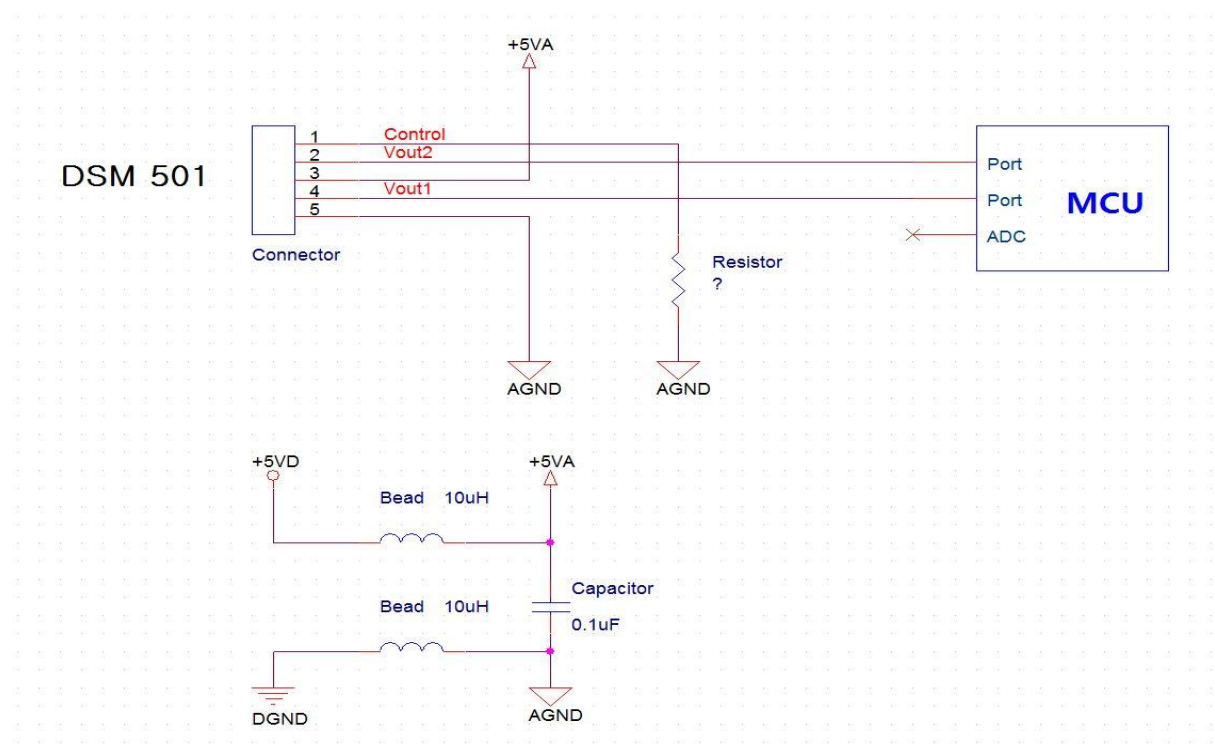


Fig.2 Sample Schematic

## 8. Detection Size Determination

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

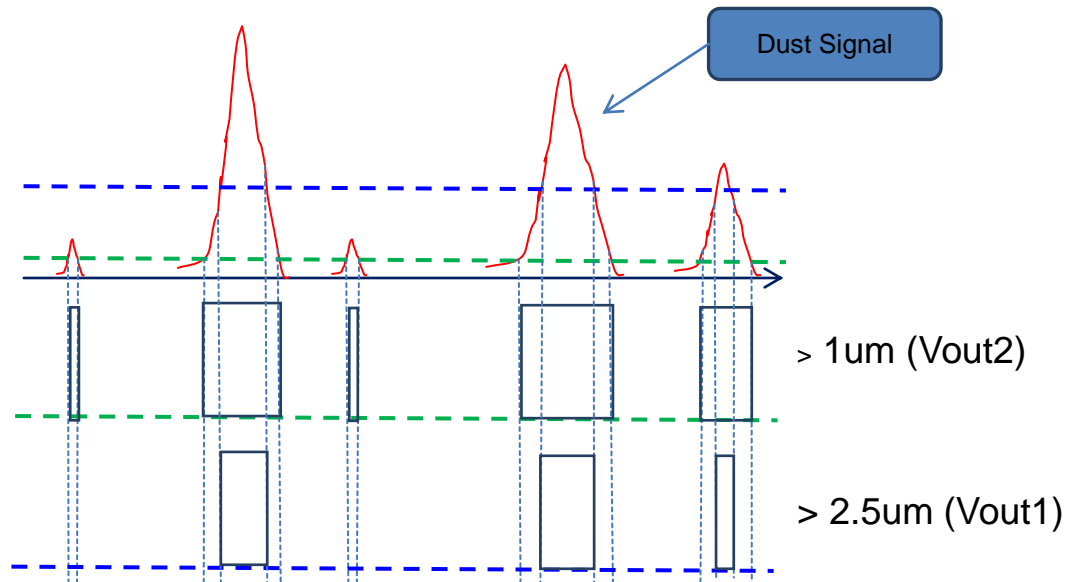
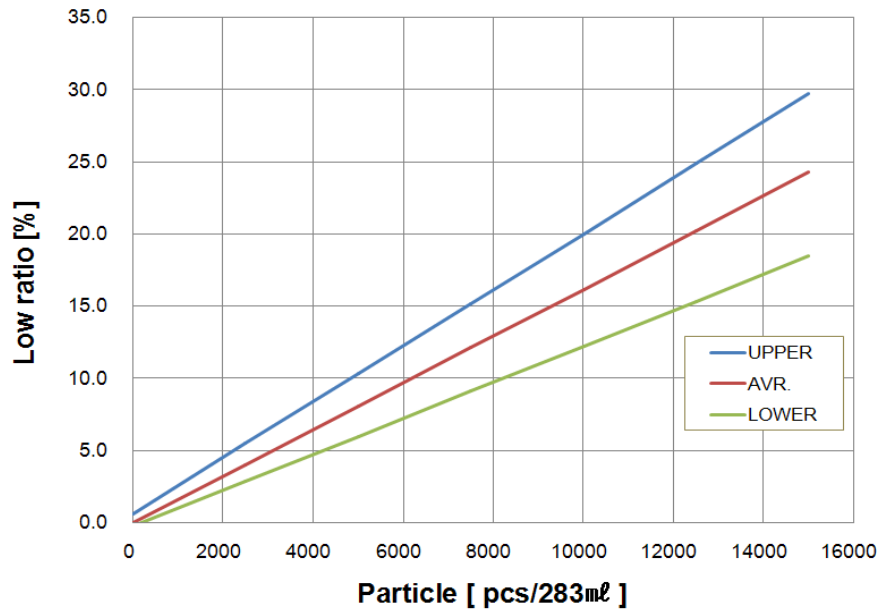


Fig.3 Detection Size Determination

## 9. Sensor Characteristics vs Low ratio

### 9-1. Dust sensor Characteristics



$$\times 1 \text{ ft}^3 = 28316.85 \text{ ml} = 0.02831685 \text{ m}^3$$

Fig.4 Sensitivity Characteristics of Dust sensor

### 9-2. Low Ratio Calculation

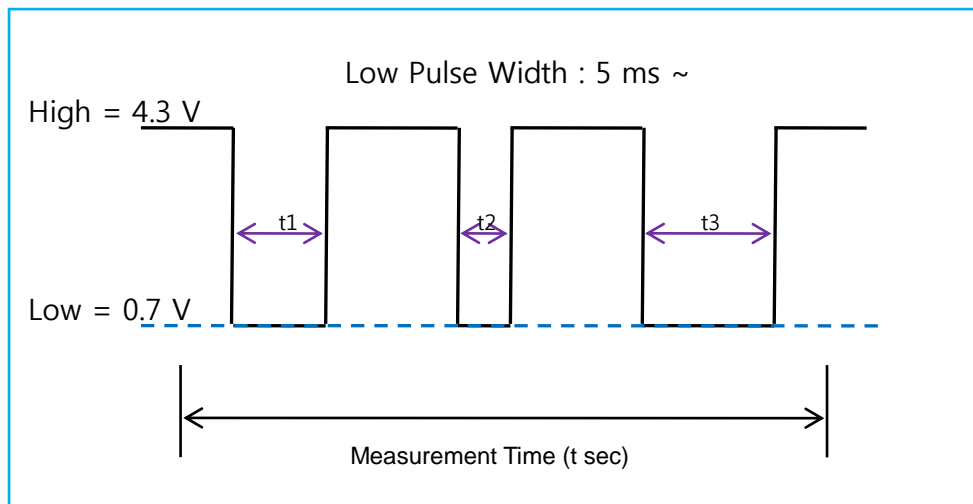


Fig.5 Dust sensor Low Ratio

$$\text{Low Ratio (\%)} = (t1 + t2 + t3) / t \times 100$$

(Measurement Time is calculated by a percentage of sum of Low signals occurred within t(5~30) seconds)



## 10. Dimension

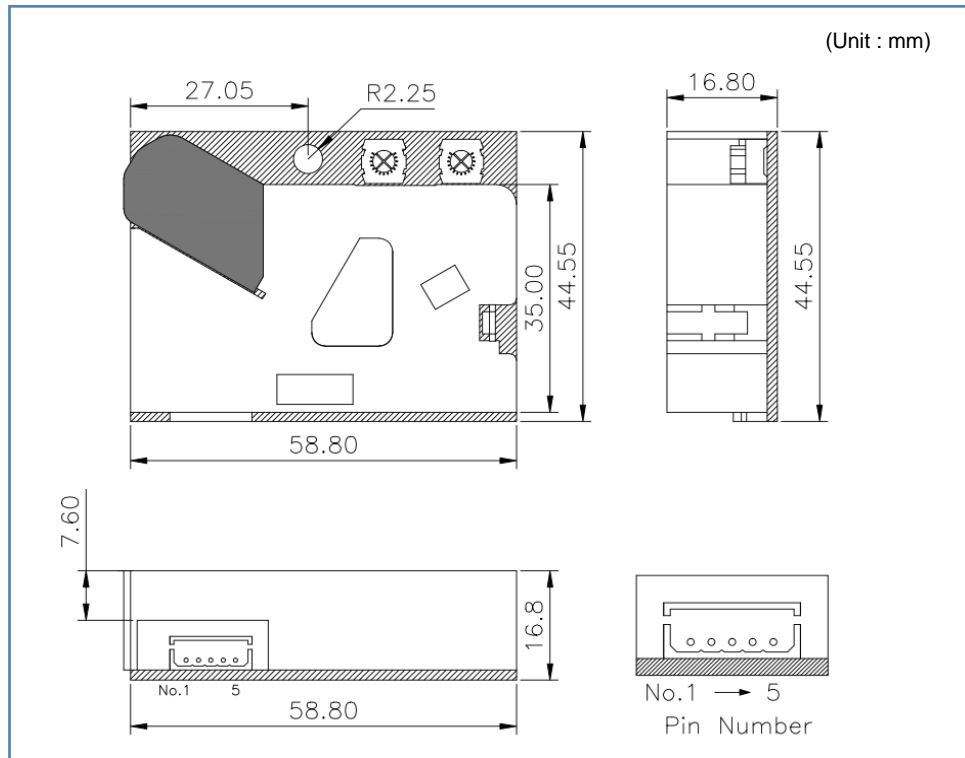


Fig.6 Dimension



## 11. Ordering Information

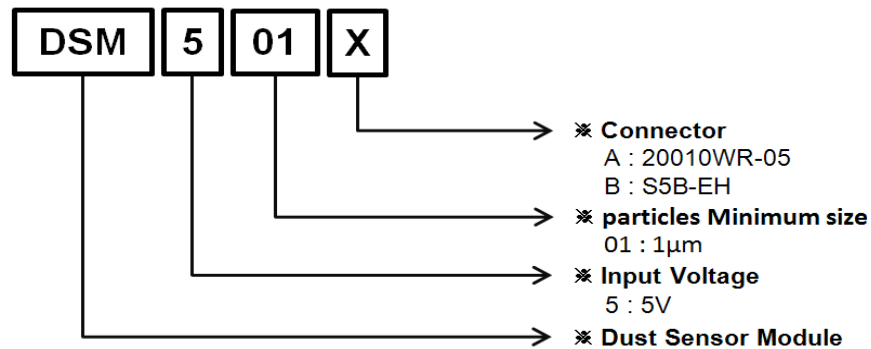


Fig.7 Ordering Information

## 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.**