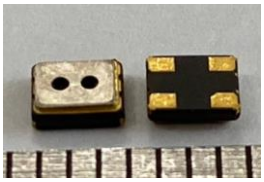
RSM411 - MEMS-based Air Quality Sensor



RSM411 for the detection of Air Contaminants

The sensing element is comprised of a sensing chip and an integrated heater formed on a silicon substrate using **MEMS technology**, and a metal-oxide semiconductor layer formed on the sensing chip. The device is housed in a surface-mount ceramic package.

RSM411 requires a heater power consumption of only 45mW, and is suitable for low-power equipment and battery-operated instruments. In the presence of detectable gas, sensor conductivity increases depending on gas concentration in the air. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to the gas concentration.

The **RSM411** has high sensitivity to low concentrations of gaseous air contaminants such as cigarette smoke and cooking odors. By utilizing the change ratio of sensor resistance from the resistance in clean air as relative response, human perception of air contaminants can be simulated, and practical air quality control can be achieved.

CONTENTS

1. FEATURES

- Surface mount package
- Low power consumption
  - Less than 45mW @ 1.7V supply
- High sensitivity Air contaminant gases
  - Cigarette smoke, Cooking odors
  - CO / Ethanol / HCHO / etc.
- Small size
  - MEMS-based semiconductor process
  - 3.2 x 2.5x0.99 mm Ceramic package
- Low cost

Device information

Part No	Package	Size (mm)
RSM411	4-Lead Ceramic	3.2 x 2.5 x 0.99

2. APPLICATIONS

- Indoor Air Quality Systems
- Air Cleaners
- IoT Devices
- Ventilation Control

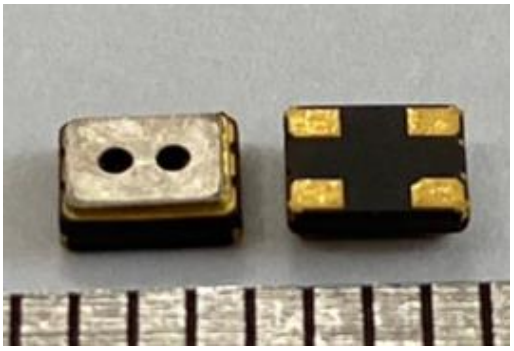


FIGURE 1. RSM411

The figure below represents typical sensitivity characteristics. All data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (R_S/R_O) which is defined as follows:

- R_S=Sensor resistance in displayed gases at various concentrations
- R_O=Sensor resistance in fresh air

SENSITIVITY CHARACTERISTICS:

The figure below represents typical temperature and humidity dependency characteristics.
The Y-axis is indicated as sensor resistance ratio (R_S/R_O) which is defined as follows:

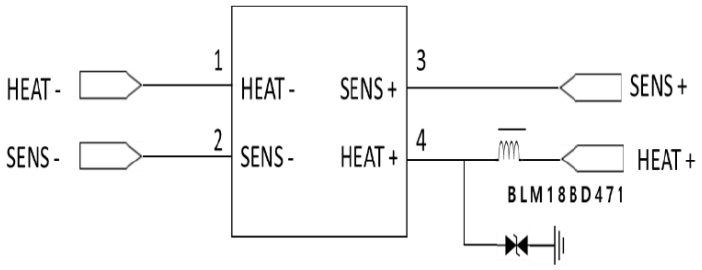
- R_S=Sensor resistance in displayed gases at various Temperatures/humidities
- R_O=Sensor resistance in fresh air at 25℃ and 60%RH

TEMPERATURE / HUMIDITY DEPENDENCE:

3. DESCRIPTION

The RSM411 is a Micro Electromechanical Systems (MEMS) based Air Quality Sensor which offers miniaturization and low power consumption. It can detect the gaseous air contaminants (CO / Ethanol / HCHO / etc.). In the sensor, the sensing materials are placed on the micro-heater, and the resistance of the sensing material is varied according to the concentration of the air pollution gases. The RSM411 is fabricated on the ceramic package with several holes. It can reduce the influence of interference gases as well as protect from humidity or dust.

Basic measuring Circuit



4. SPECIFICATIONS

Model			RSM411
Sensing principle			MOS type
Standard package			4-Lead Ceramic
Target gases			Air contaminants (Hydrogen, ethanol, CO, etc.)
Typical detection range			1~25 ppm CO
Electrical characteristics under std test conditions	Heater voltage	V_H	1.7 V DC
	Heater Resistance	R_H	Approx. 40Ω at RT
	Heater Current	I_H	26mA
	Heater Power consumption	P_H	45 mW (typical)
	Sensor Resistance	R_S	10~500 KΩ in Air
	Sensitivity (change ratio of R_S)		~0.5 (Rs / Rs air @CO 10ppm)
Standard test conditions	Test gas conditions		Normal air at 25±2℃, 60±5% RH
	Circuit conditions		Same as std circuit conditions
	Conditioning period before test		More than 12 hours

- Sensor resistance (R_S) is calculated with a measured value of V_{OUT} by using the following formula:

$$R_S = \left(\frac{V_C}{V_R} - 1\right) X\ R_L$$

5. APPLICATION GUIDE

Since the output of the RSM411 is a resistance, a conventional measurement part should have a current source in parallel with the output of the sensor to convert the resistance to voltage. For ESD protection, the diode or bead is also suggested in the power pin. Its configuration is illustrated in the typical application diagram.

6. PIN CONFIGURATION AND DIMENSIONS

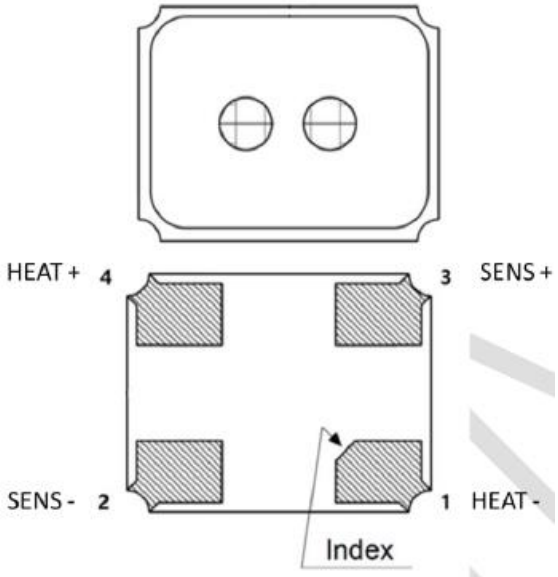


FIGURE 2. PIN CONFIGURATION

Pin functions

PIN		Type[1)]	FUNCTION
NAME	NO.	I/O	
HEAT-	1	G	Negative input
SENS-	2	G	Negative
SENS+	3	O	Positive output
HEAT+	4	P	Positive output

1) Type: I=input, O=output, I/O=input and output, P=power supply, GND=ground

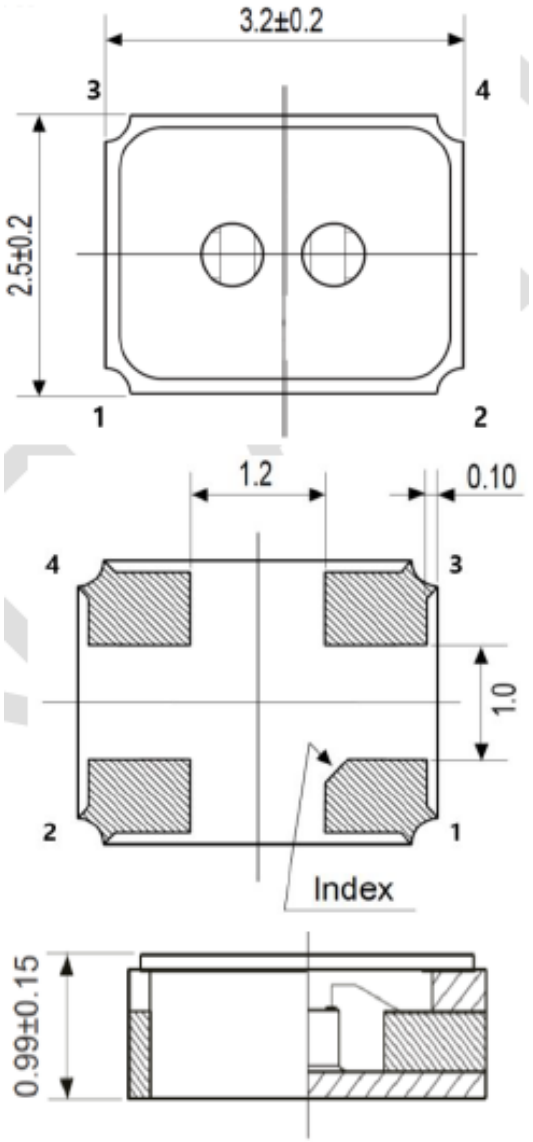


FIGURE 3. PACKAGE DIMENSION

7. TYPICAL CHARACTERISTICS

8. REVISION HISTORY

Rev. No	Chapter	Description of modification	Date
0.1		Initial release	April. 2021

For inquiries about Gas Sensor products, please contact us below.

#1001, 823, Dongtansunhwan-daero,
Hwaseong-si, Gyeonggi-do, Korea. 18471
www.RNSLab.com
e-mail. admin@rnslab.com
Tel. +82-31-5183-5131