O_3 Gas Sensor

This datasheet describes the use of the sensor M2610 in ozone detection applications. The package and the mode of operation described in this document target the detection of the oxidizing gas O_3 in indoor or outdoor environments. Ozone is a hazardous gas, which can cause respiratory problems at concentrations above 100 ppb.

Feature

- Low heater current
- Wide detection range
- High sensitivity
- Fast thermal response
- Electro-Static Discharge protected
- Miniature dimensions
- High resistance to shocks and vibrations

Important Precautions

Please read the following instructions carefully before using the M2610 sensor described in this document to avoid erroneous readings and to prevent the device from permanent damage.

- The sensor must not be wave soldered without protection or exposed to high concentrations of organic solvents, ammonia, or silicone vapors in order to avoid poisoning the sensitive layer.
- Heating powers above the specified maximum rating of 95 mW can destroy the sensor due to overheating.
- After exposing the sensor to high concentrations of O_3, make sure the sensor is given enough time to recover before taking new measurements.

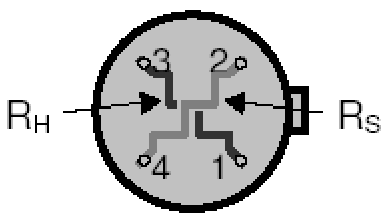
Operating Mode

The recommended mode of operation is a constant voltage mode. A heating power of P_H = 80 mW is applied. This causes the temperature of the sensing resistor (R_S) to reach about 430°C.
Detection of the O_3 concentration is achieved by measuring the sensing resistor R_S during operation.

Measurement circuit

Figure 2 shows the pin connections of the M2610 ozone sensor. A simple circuit to measure the O_3 concentration is proposed in Figure 3. The heating voltage V_H is applied to pins 3 and 1. A load resistor R_L is connected in series with R_S to convert the resistance R_S to a voltage V_S between pins 2 and 4. R_S can then be calculated by the following expression:

$R_S = R_L /(V_{CC} - V_S) \cdot V_S$



Pin Number	
1	Heater Ground
2	Sensor Pin
3	Heater Power
4	Sensor Pin

Figure2: Equivalent circuit(top view)

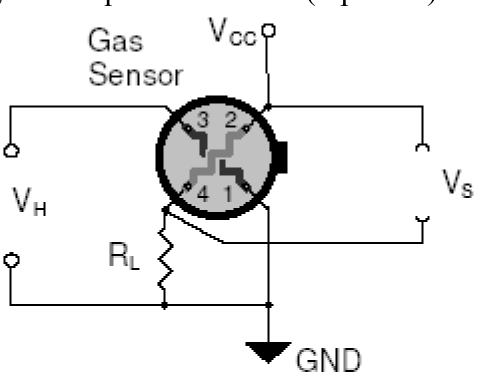


Figure3: Measurement circuit for O_3 detection

Sensor Response

The sensor response to O_3 in air is represented in Figure 1. The sensor resistance R_S is normalized to the resistance under 100 ppb of O_3 (R_{100ppb}).

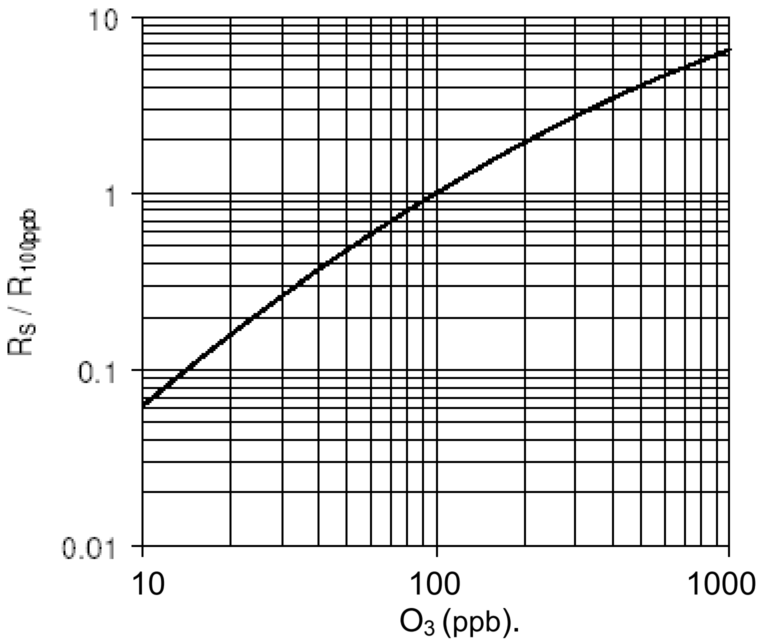


Figure 1: Rs / R100ppb as a function of gas concentration at 50% RH and 25°C.

Electrical Specifications

Maximum Ratings :

Rating	Symbol	Value / Range			Unit
Maximum Sensor Supply Voltage	V_{cc}		5		V
Maximum Heater Power Dissipation [1]	P_H		95		mW
Maximum Sensor Power Dissipation	P_s		1		mW
Relative Humidity Range	R_H	5	-	95	%RH
Ambient Operating Temperature	T_{amb}	-40	-	70	°C
Storage Temperature Range [2]	T_{sto}	-40	-	50	°C
Storage Humidity Range	RH_{sto}	5	-	95	%RH

Table 1

[1] Heating Powers above 95 mW can cause permanent damage to the sensor due to overheating.

[2] Storage of parts in original shipping package

Operating Conditions :

Parameter	Symbol	Typ	Min	Max	Unit
Heating Power [3]	P_H	80	66	95	mW
Heating Voltage	V_H	2.35	-	-	V
Heating Current	I_H	34	-	-	mA
Heating Resistance[4]	R_H	68	58	78	Ω

Table 2

[3] To ensure a correct operating temperature the heater voltage should be ajusted so that the resulting heating power equals 80 mW. Lower heating power will reduce the sensitivity and increase the response time. Heating powers above 95 mW can cause permanent damage to the sensor due to overheating.

[4] Heating resistor values from sensors out of production range between 58 and 78 ohm measured at V_H = 2.35 V. Due to material properties of the heating resistor its value increases during operating life.

Sensitivity Characteristics :

Characteristic	Symbol	Typ	Min	Max	Unit
O_3 Detection Range	FS		10	1000	ppb
Sensing Resistance in air	R_o	11	3	60	KΩ
Sensitivity Factor [5]	S_R	2	1.5	4	-

Table 3

[5] Sensitivity Factor S_R is defined RS at 100 ppb of O_3 divided by RS at 50 ppb of O_3. Test conditions are 50±5 % RH and 25±2 °C.

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