

This datasheet describes the use of the MiCS-2611 in ozone detection applications. The package and the mode of operation described in this document target the detection of the oxidising gas O₃ in indoor or outdoor environments. Ozone is a hazardous gas, which can cause respiratory problems at concentrations above 100 ppb.

FEATURES

- Low heater current
- Wide detection range
- High sensitivity
- Fast thermal response
- Miniature dimensions
- High resistance to shocks and vibrations
- Protective cap

IMPORTANT PRECAUTIONS

Read the following instructions carefully before using the MiCS-2611 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 vapours, to avoid poisoning the sensitive layer.
- Heating powers above the maximum rating of 95 mW can destroy the sensor due to overheating.
- After exposing the sensor to high concentrations of O₃, make sure the sensor is given enough time to recover before taking new measurements.
- For any additional questions, email enquiries@e2v.com or telephone +44 (0)1245 493493.

OPERATING MODE

The recommended mode of operation is a constant voltage mode. A heater 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 O₃ concentration is achieved by measuring the sensing resistor R_S during operation.



SENSOR RESPONSE

The sensor response to O₃ in air is represented in Fig. 1. The sensor resistance R_S is normalised to the resistance under 100 ppb of O₃ (R_{100ppb}).

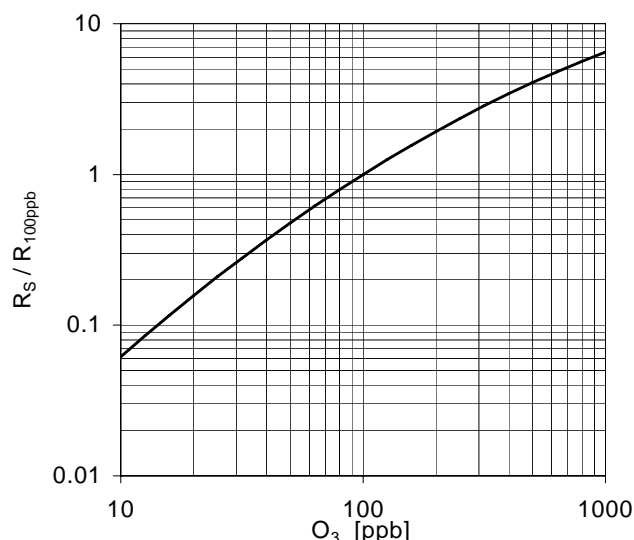


Fig. 1: R_S/R_0 as a function of gas concentration at 50% RH and 25 °C.

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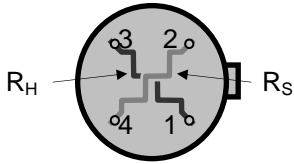
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MEASUREMENT CIRCUIT

Fig. 2 shows the pin connections of the MiCS-2611 ozone sensor. A simple circuit to measure the O₃ concentration is proposed in Fig. 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:

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



| Pin | Connection |
|-----|---------------|
| 1 | Heater ground |
| 2 | Sensor pin |
| 3 | Heater power |
| 4 | Sensor pin |

Fig. 2: Equivalent circuit of MiCS-2611 (top view)

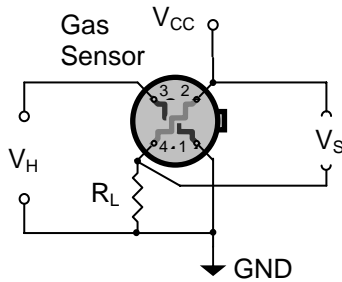


Fig. 3: Measurement circuit for O₃ detection

ELECTRICAL SPECIFICATIONS

Maximum Ratings

| Rating | Symbol | Value/Range | Unit |
|---|-------------------|-------------|------|
| Maximum sensor supply voltage | V _{CC} | 5 | V |
| Maximum heater power dissipation (see note 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 (see note 2) | T _{sto} | -40 – 50 | °C |
| Storage humidity range | RH _{sto} | 5 – 95 | %RH |

Operating Conditions

| Parameter | Symbol | Typ | Min | Max | Unit |
|---------------------------------|----------------|------|-----|-----|------|
| Heating power (see note 3) | P _H | 80 | 66 | 95 | mW |
| Heating voltage | V _H | 2.35 | - | - | V |
| Heating current | I _H | 34 | - | - | mA |
| Heating resistance (see note 4) | R _H | 68 | 58 | 78 | Ω |

Sensitivity Characteristics

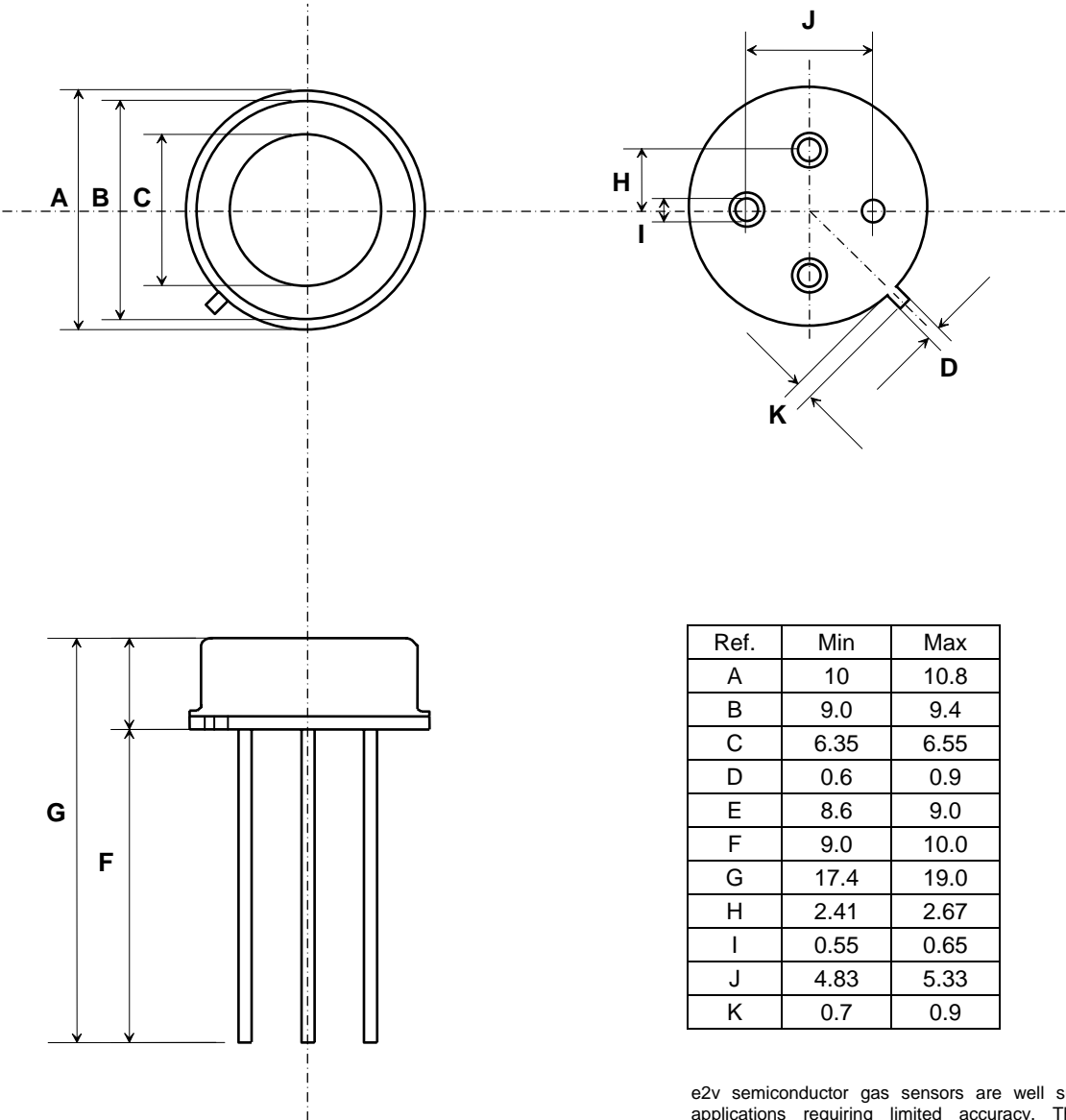
| Characteristic | Symbol | Typ | Min | Max | Unit |
|---------------------------------|----------------|-----|-----|------|------|
| O ₃ detection range | FS | | 10 | 1000 | ppb |
| Sensing resistance in air | R ₀ | 11 | 3 | 60 | kΩ |
| Sensitivity factor (see note 5) | S _R | 2 | 1.5 | 4 | - |

Notes:

1. Heating powers above 95 mW can cause permanent damage to the sensor due to overheating.
2. Storage of parts in original shipping package.
3. To ensure a correct operating temperature, the heater voltage should be adjusted 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 Ω and 78 Ω measured at V_H = 2.35 V. Due to material properties of the heating resistor its value increases during operating life.
5. Sensitivity factor S_R is defined as R_S at 100 ppb of O₃ divided by R_S at 50 ppb of O₃. Test conditions are 50 ± 5% RH and 25 ± 2 °C.

PACKAGE OUTLINE

(All dimensions nominal and in millimetres)



e2v semiconductor gas sensors are well suited for leak detection and applications requiring limited accuracy. Their use for absolute gas concentration detection is more complicated because they typically require temperature compensation, calibration, and sometimes as well, humidity compensation. Their base resistance in clean air and their sensitivity can vary overtime depending on the environment they are in. This effect must be taken into account for any application development (41-4.0).