# MiCS-5525
# CO Sensor

This datasheet describes the use & performance of the MiCS-5525 sensor. The package and the mode of operation illustrated in this document targets the detection of carbon monoxide (CO).


**Product shown with cap containing charcoal filter**

## FEATURES

- Low heater current
- Wide detection range
- Wide temperature range
- High sensitivity
- Miniature dimensions
- High resistance to shocks and vibrations
- Charcoal filter to improve selectivity to CO

## OPERATING MODE

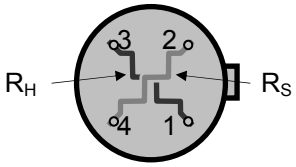
The recommended mode of operation is constant power. The nominal power is $P_H$ = 76 mW. The resulting temperature of the sensing layer is ~340 °C, in air at an ambient temperature of ~ 20 °C.

Detection of the pollution gases is achieved by measuring the sensing resistance of the sensor. The resistance decreases in the presence of CO.

## SENSOR CONFIGURATION

The silicon gas sensor structure consists of an accurately micro machined diaphragm with an embedded heating resistor and the sensing layer on top.

The internal connections are shown below:




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

**Figure 1: Equivalent circuit of MiCS-5525 (top view)**

## POWER CIRCUIT EXAMPLE

The heating voltage $V_H$ can be applied by applying Vcc (5V) to an 82 Ω resistor connected to pin 3 and pin 1 is connected to GND. This resistor is necessary to obtain the right heater power (2.4 V and 76 mW).

## SENSOR CHARACTERISTICS

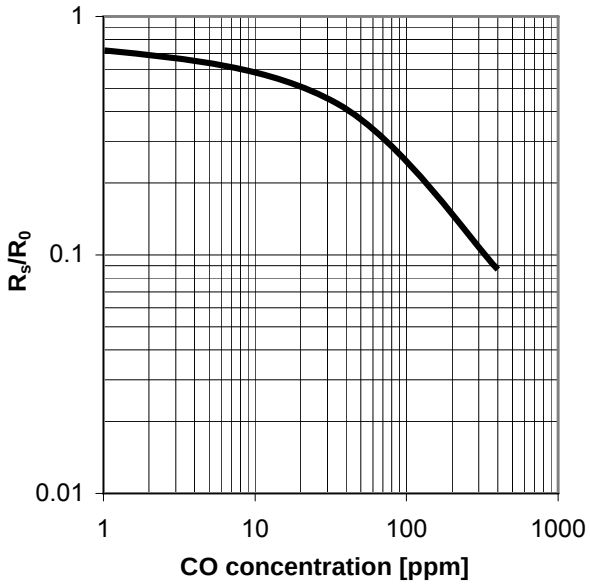



**Figure 2: $R_s/R_0$ as a function of CO concentration at 40% RH and 25 °C, measured on an engineering test bench**



e2v technologies (uk) limited, Waterhouse Lane, Chelmsford, Essex CM1 2QU United Kingdom Telephone: +44 (0)1245 493493 Facsimile: +44 (0)1245 492492
e-mail: enquiries@e2v.com Internet: www.e2v.com Holding Company: e2v technologies plc
e2v technologies inc. 520 White Plains Road, Suite 450, Tarrytown, NY10591 USA Telephone: (914) 592-6050 Facsimile: (914) 592-5148 e-mail: enquiries@e2vtechnologies.us

## MEASUREMENT CIRCUIT EXAMPLE

As shown below, the sensitive resistance is measured using a load resistor.

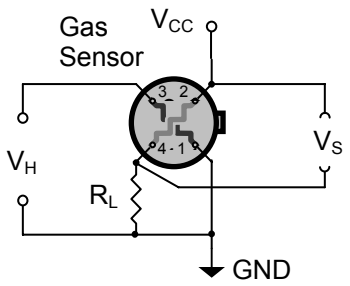



**Figure 3: MiCS-5525 with measurement circuit (top view)**

The voltage measured on the load resistor is a direct measure of the resistance of the sensor. $R_L$ must be equal or greater than 820 Ω in order not to damage the sensing layer.

## ELECTRICAL CHARACTERISTICS

| Rating | Symbol | Value/Range | Unit |
|---|---|---|---|
| Maximum heater power dissipation | $P_H$ | 88 | mW |
| Maximum sensitive layer power dissipation | $P_S$ | 8 | mW |
| Voltage supply | $V_{supply}$ | 4.9 - 5.1 | V |
| Relative humidity range | $R_H$ | 5 - 95 | %RH |
| Ambient operating temperature | $T_{amb}$ | -30 - 85 | °C |
| Storage temperature range | $T_{sto}$ | -40 - 120 | °C |
| Storage humidity range | $RH_{sto}$ | 5 - 95 | %RH |

## OPERATING CONDITIONS

| Parameter | Symbol | Typ | Min | Max | Unit |
|---|---|---|---|---|---|
| Heating power | $P_H$ | 76 | 71 | 81 | mW |
| Heating voltage | $V_H$ | 2.4 | - | - | V |
| Heating current | $I_H$ | 32 | - | - | mA |
| Heating resistance at nominal power | $R_H$ | 74 | 66 | 82 | Ω |

## SENSITIVITY CHARACTERISTICS

| Characteristic | Symbol | Typ | Min | Max | Unit |
|---|---|---|---|---|---|
| CO detection range | FS | | 1 | 1000 | ppm |
| Sensing resistance in air (see note 1) | $R_0$ | - | 100 | 1500 | kΩ |
| Sensitivity CO 60 ppm (see note 2) | $S_{60}$ | - | 5 | 50 | - |

**Notes:**

1. Sensing resistance in air, $R_0$, is measured under controlled ambient conditions, i.e. synthetic air at 23 ± 5 °C and 50 ± 10%. Sampling test.

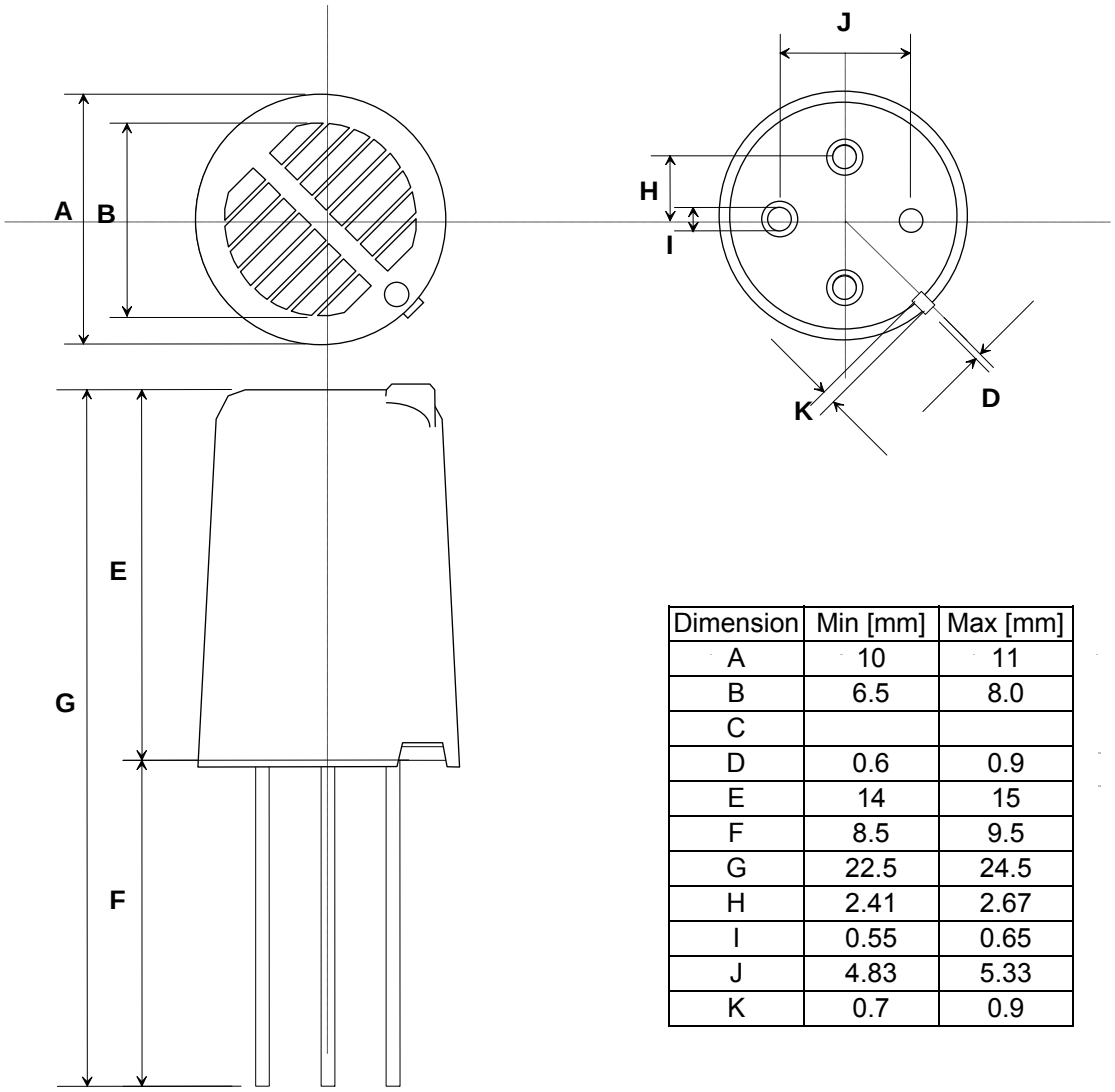
2. Sensitivity CO 60 ppm is defined as $R_S$ in air divided by $R_S$ at 60 ppm CO. Test conditions are 23 ± 5 °C and 50 ± 10% RH. Indicative values only, sampling test.

## IMPORTANT PRECAUTIONS

**Read the following instructions carefully before using the MiCS-5525 described in this document to avoid erroneous readings and to prevent the device from permanent damage.**

- The sensor must be reflow soldered in a neutral atmosphere, without soldering flux vapours.
- The sensor must not be exposed to high concentrations of organic solvents, ammonia, silicone vapour or cigarette-smoke in order to avoid poisoning the sensitive layer.
- Heater voltages above the specified maximum rating will destroy the sensor due to overheating.
- This sensor is to be placed in a filtered package that protects it against water and dust projections.
- e2v strongly recommends using ESD protection equipment to handle the sensor.
- For any additional questions, contact e2v.

## PACKAGE AND FILTER OUTLINE




| Dimension | Min [mm] | Max [mm] |
|---|---|---|
| A | 10 | 11 |
| B | 6.5 | 8.0 |
| C | | |
| D | 0.6 | 0.9 |
| E | 14 | 15 |
| F | 8.5 | 9.5 |
| G | 22.5 | 24.5 |
| H | 2.41 | 2.67 |
| I | 0.55 | 0.65 |
| J | 4.83 | 5.33 |
| K | 0.7 | 0.9 |

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 over time depending on their environment. This effect must be taken into account for any application development (1102-1.0).