

The MiCS-5521 is a general CO/VOC sensor. The package and the mode of operation illustrated in this document target the detection of reducing gases such as carbon monoxide (CO), hydrocarbons (HC), and volatile organic compounds (VOC).

### FEATURES

- Low heater current
- Wide detection range
- High sensitivity
- Short pre-heating time
- Miniature dimensions
- High resistance to shocks and vibrations

### IMPORTANT PRECAUTIONS

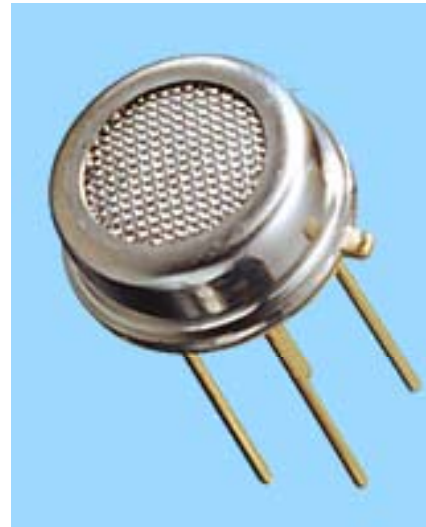
**Read the following instructions carefully before using the MiCS-5521 sensor described in this document to avoid erroneous readings and to prevent the device from permanent damage.**

- 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.
- 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 any water or dust projection.
- The use of ESD protection equipment to handle the sensor is strongly recommended.
- For any additional questions, email [enquiries@e2v.com](mailto:enquiries@e2v.com) or telephone +44 (0)1245 493493.

### OPERATING MODE

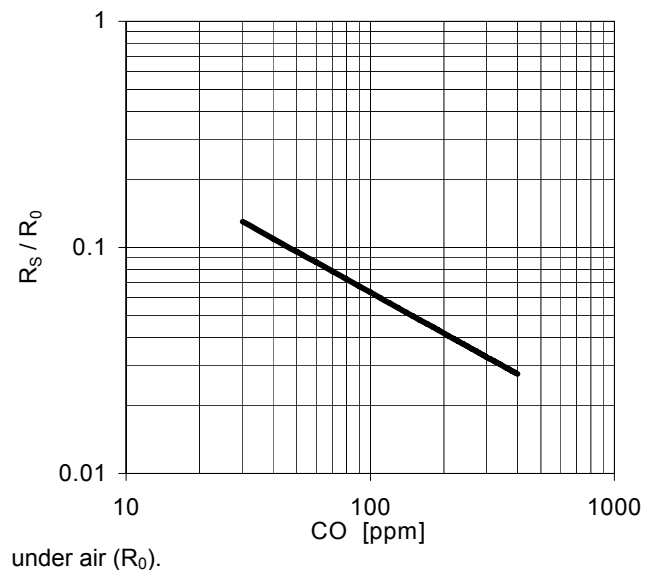
The recommended mode of operation is a constant power mode. A heater power of  $P_H = 76 \text{ mW}$  is applied. This causes the temperature of the sensing resistor ( $R_S$ ) to reach about  $340^\circ\text{C}$ .

Detection of the pollution gases is achieved by measuring the sensing resistor  $R_S$  during operation.



### SENSOR RESPONSE

The sensor response to CO in air is represented in Fig. 1. The sensor resistance  $R_S$  is normalised to the resistance under air ( $R_0$ ).



**Fig. 1:  $R_S/R_0$  as a function of CO concentration at 50% RH and  $25^\circ\text{C}$ .**

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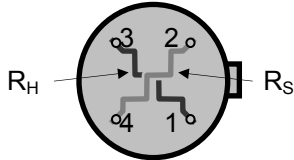
## MEASUREMENT CIRCUIT

Fig. 2 shows the pin connections of the MiCS-5521 gas sensor. A simple circuit to measure the pollution level is proposed in Fig. 3. The heating voltage  $V_H$  is applied to a 75  $\Omega$  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).

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:

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

$R_L$  must be 820  $\Omega$  at the lowest in order not to damage the sensitive layer.



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

Fig. 2: Equivalent circuit of MiCS-5521 (top view)

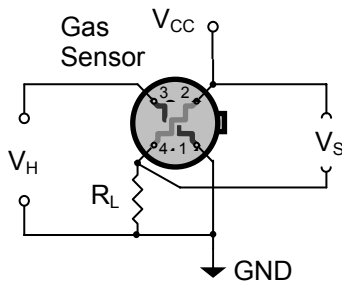


Fig. 3: Measurement circuit for pollution gas detection

## ELECTRICAL SPECIFICATIONS

### Maximum Ratings

Rating	Symbol	Value/Range	Unit
Maximum sensor supply voltage	$V_{CC}$	$5 \pm 0.1$	V
Maximum heater power dissipation	$P_H$	88	mW
Maximum sensitive layer power dissipation	$P_S$	8	mW
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 (see note 1)	$R_H$	74	66	82	$\Omega$

### Sensitivity Characteristics

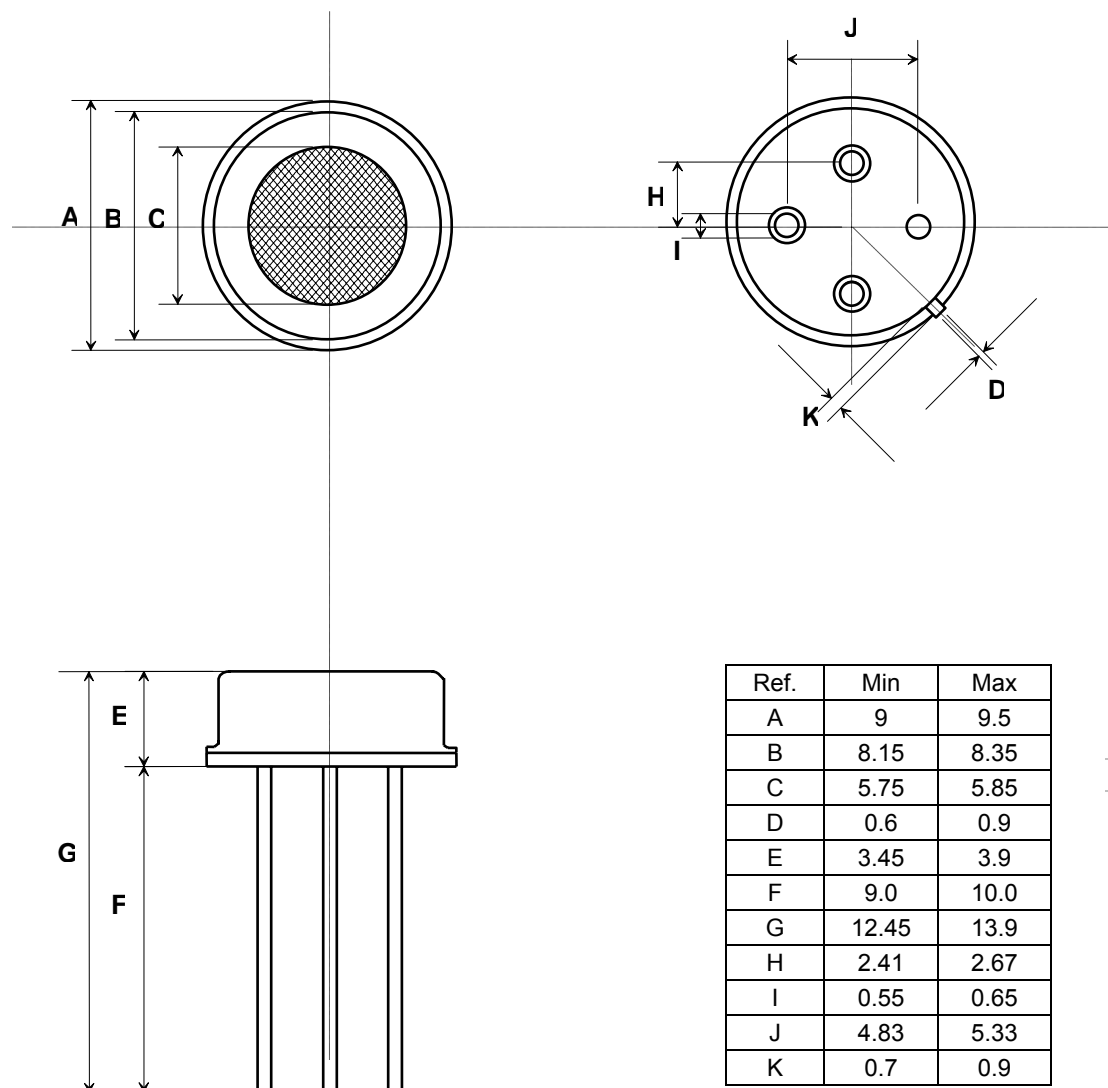
Characteristic	Symbol	Typ	Min	Max	Unit
CO detection range	FS		1	1000	ppm
Sensing resistance in air (see note 2)	$R_0$	-	100	1000	k $\Omega$
Sensitivity factor (see note 3)	$S_R$	3.0	1.8	6.6	-

### Notes:

1. Resistance at heating power.
2. Sensing resistance in air ( $R_0$ ) is measured under controlled ambient conditions, i.e. synthetic air at  $23 \pm 5$  °C and  $50 \pm 10\%$  RH.
3. Sensitivity factor ( $S_R$ ) is defined as  $R_S$  at 60 ppm of CO divided by  $R_S$  at 200ppm of CO. Test conditions are  $23 \pm 5$  °C and  $50 \pm 10\%$  RH.

## PACKAGE AND FILTER OUTLINE

(All dimensions nominal and in millimetres)



### Outline Note:

A perfect pin alignment is not guaranteed.

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 (282-7.0).