



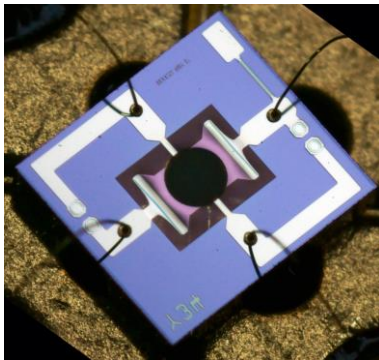
M I C R O S E N S

Product Data Sheet

## MSGS 3000i

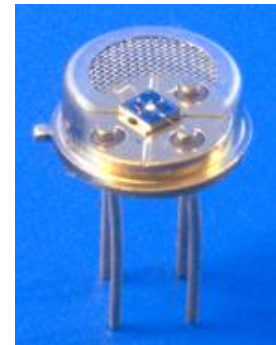
### MICROSENS Semiconductor Gas Sensor

#### MSGS-300i Carbon Monoxide/VOC Gas Sensor



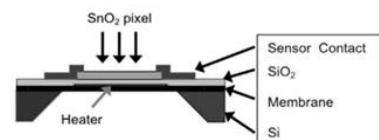
MSGS-3000i integrated semiconductor gas sensors manufactured using standard microelectronic technology and silicon micromachining techniques.

Detection of reducing gases such as carbon monoxide (CO), hydrocarbons (HC), ethanol, and volatile organic compounds (VOC).



#### Sensing Principle

The MSGS-3000i structure consists of a thin-film, doped tin-oxide ( $\text{SnO}_2$ ) layer over an embedded heater layer. This integrated heater allows to raise the temperature of the sensitive layer necessary for the Chemisorption/Reaction mechanisms to occur.



#### Applications

- Indoor air quality
- Industrial process control
- Combustion control
- Environmental monitoring
- Security:
  - Toxic gases
  - Explosive gases

#### Key Specifications

- Typical concentration range: 1ppm – 10000ppm
- High sensitivity at low concentrations (< 5ppm)
- Low power consumption
- Fast response time: < 30s (90% signal level)
- Packaging: TO5

MICROSENS SA

Rue de la Maladière 71c, CP 645, CH-2002 Neuchâtel/Switzerland, Tel: +41-32-724 55 66  
EPFL Innovation Park, Batiment D, 1015 Lausanne, Switzerland, Tel.:+41-21-353 91 35

e-mail : [info@microsens.ch](mailto:info@microsens.ch), [www.microsens.ch](http://www.microsens.ch)

## Specifications

### Maximum Ratings

Rating	Symbol	Value/ Range	Unit
Maximum sensor supply voltage	$V_{CC}$	5	V
Maximum heater power	$P_H$	120	mW
Maximum sensor power	$P_S$	1	mW
Relative humidity range	$R_H$	5 – 95	%RH
Ambient operating temperature	$T_{amb}$	-40 – 120	°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 (see note 1)	$P_H$	102	85	120	mW
Heating voltage	$V_H$	2.8	-	3.2	V
Heating resistance at heating power (see note 2)	$R_H$	80	75	85	$\Omega$

### Sensitivity Characteristics

Characteristic	Symbol	Typ	Min	Max	Unit
CO detection range	FS		1	1000	ppm
Sensing resistance in air (see note 3)	$R_0$	100	20	400	k $\Omega$
Sensitivity factor (see note 4)	$S_R$	2.2	1.5	3.0	-

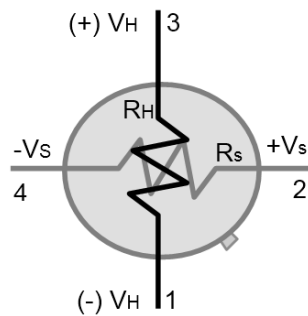
### Notes:

1. A power of 85mW might provide sufficient sensitivity to certain gases. Heating powers above 120mW can cause permanent damage to the sensor when ambient temperatures exceed 120 °C.
2. Heating resistor values from sensors out of production range between 75 and 85  $\Omega$  ( $P_H$  between 85-120mW). Due to material properties of the heating resistor, its value increases during operating life. This behaviour has to be taken into account in the application design.
3. Sensing resistance in air ( $R_0$ ) is measured under ambient air at  $23 \pm 5$  °C and  $50 \pm 10\%$  RH. These values are representative of most sensors, but some sensors could present  $R_0$  from 1 k $\Omega$  to 1 M $\Omega$ .
4. Sensitivity factor ( $S_R$ ) is defined as  $R_S$  at 60 ppm of CO. Test conditions are  $23 \pm 5$  °C and  $50 \pm 10\%$  RH. The  $S_R$  values are indicative values only.

**Features**

- Sensitivity range: 5 to over 1000 ppm CO
- Low humidity dependence in recommended operation mode
- Stable long-term operation
- Small size
- Low power consumption

**Pin Connections**



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

Figure 1: Sensor equivalent circuit (Top view)

**Recommended measurement circuit**

A simple circuit to measure the pollution level is proposed in Fig. 2. 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:

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

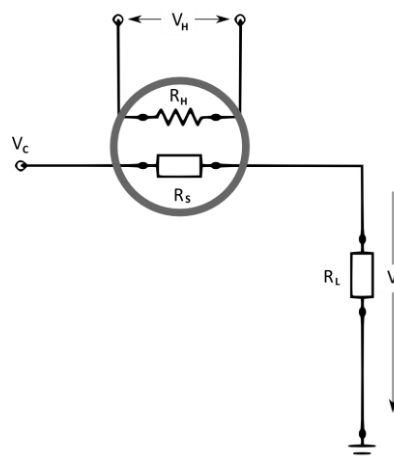


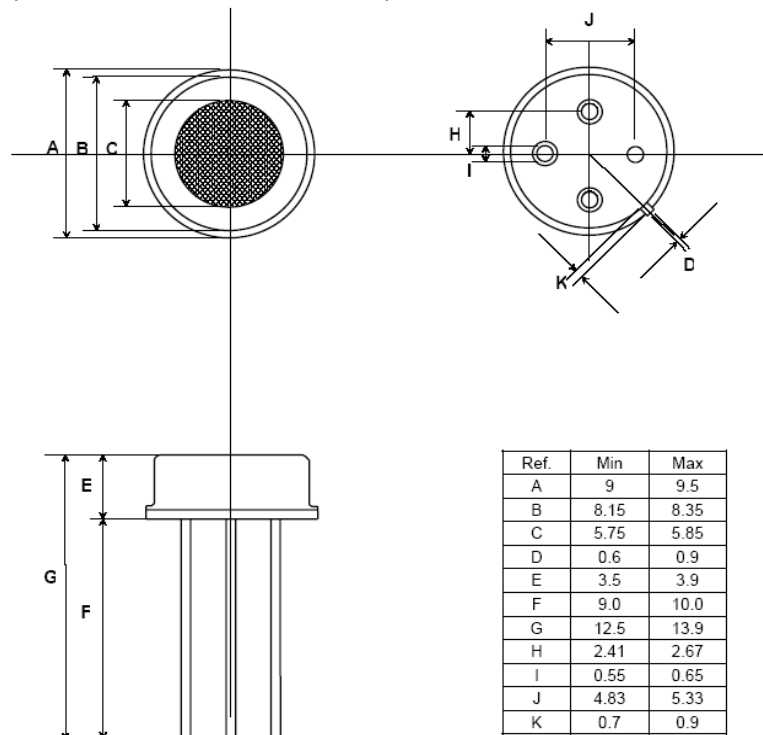
Figure 2: Measurement circuit for pollution gas detection

**Precautions**

- 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 120 mW can 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

**Package Outline**

(All dimensions nominal and in millimetres)



Ref.	Min	Max
A	9	9.5
B	8.15	8.35
C	5.75	5.85
D	0.6	0.9
E	3.5	3.9
F	9.0	10.0
G	12.5	13.9
H	2.41	2.67
I	0.55	0.65
J	4.83	5.33
K	0.7	0.9

**Outline Note:**  
A perfect pin alignment is not guaranteed.

**Chip dimensions:**

- Chip size: ~ 2mm x 2mm located on the centre of the TO package
- Sensitive area: ~ 300µm x 300µm
- Chip thickness: ~ 300 µm