

# MTCS 2601 - Gas

## Micro Thermal Conductivity Sensor for Gas Detection

### Applications

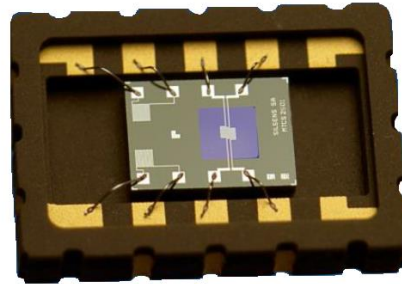
Applications are primary industrial process control (binary mixture), horticulture and food storage (CO<sub>2</sub>), security (CO<sub>2</sub> monitoring, fire alarm, H<sub>2</sub>), natural gas engine or hydrogen engine full cell, detection of refrigerant. This type of device is also used as leakage detection as well as pressure sensor for primary vacuum control following Pirani principle.

### Industry

- Determining gas concentration by measuring the thermal conductivity in binary mixture or quasi-binary mixture (H<sub>2</sub>, He or CO<sub>2</sub> in air)
- Monitoring of CH<sub>4</sub> concentration in Natural Gas for gas engine control
- Detection of refrigerant gases such as Freons (R-11; R-12, R-21, R-22), CFC or CF<sub>3</sub>CH<sub>2</sub>F Fluoroethane (R-134 or R-404) for leakage monitoring of cooling System
- Measurement of Hydrogen (0 to 5% or higher), Helium (0 – 5000 ppm) or Xenon in air
- Security (fire alarm, CO<sub>2</sub> monitoring, explosive gas monitoring)
- Industrial process control, horticulture, food storage, fermentation process Control
- Micro vacuum device as miniature Pirani gauge
- Micro absolute humidity sensor in air based on thermal conductivity

### Domestic use

- CO<sub>2</sub> safety monitoring (0-4%) for Security, Fire Alarms or Indoor Air Quality



### General description

The **MTCS2601** sensors consist of a micro-machined thermal conductivity sensor using four Ni-Pt resistors realized using MEMS technologies. The sensor is mounted in a miniature SMD package, available on tape and reel. This MEMS TC sensor, combined with simple low power CMOS standard integrated circuits, is an excellent choice for OEM gas detector requiring ultra-low power consumption, long lifetime and no maintenance. This device measures gas concentrations of binary or tertiary gas mixtures or quasi binary mixture in air, such as gas in air with lower thermal conductivity as carbon dioxide, argon or Freon's, or with higher thermal conductivity such as hydrogen, helium or methane.

### Features

- Robust MEMS physical sensing principle with no chemical reaction, based on gas thermal conductivity variation
- Measuring range from 100 ppm to 100% depending on the application and the thermal conductivity of the gas
- No chemical reactants, linear signal with concentration without hysteresis
- Temperature compensated with excellent matching of compensation and heating resistors on the same silicon die
- Ultra small sensor gas volume such as < 0.1 cm<sup>3</sup>
- Robust and long MTBF due to physical resistive sensing principles, High shock survivability (>1000 G)
- Ultra-low power sensor consumption in operation (< 8mW) due to the use of MEMS based silicon sensor with large integrated resistors such as 250 Ohms and small heated mass.
- Ultra-fast response time < 50 ms with large electronics bandwidth

## Silicon sensor MTCS2600 characteristics

	Symbol	Min	Typical	Max	Units
<b>Sensor electrical characteristics</b>					
Measuring resistor	$R_{m_1}$ and $R_{m_2}$	110	120	135	$\Omega$
Reference resistor	$R_{t_1}$ and $R_{t_2}$	240	265	300	$\Omega$
Ratio	$(R_{t_1}+R_{t_2})/(R_{m_1}+R_{m_2})$	2.00	2.20	2.35	-
Resistor Thermal Coefficient	$\alpha$	0.0045	0.0050	0.0055	$^{\circ}\text{K}$

### Absolute maximum ratings

Heating current in $(R_{m_1}+R_{m_2})$	$I_m$		5.0		mA
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### Storage condition

Temperature			-40 to +100		$^{\circ}\text{C}$
Humidity			0 – 100, non condensing		%RH

### Recommended operating conditions

Heating current $R_{m_1}+R_{m_2}$ current			4.5 – 5.5		mA
Temperature			-40 to +85		$^{\circ}\text{C}$
Humidity			0 – 100, non condensing		%RH
MTBF within recommended operating condition			30'000		Hours

## Sensor package information

**MTCS sensor in SMD package:** 7.00 mm x 5.0 mm x 1.50 mm

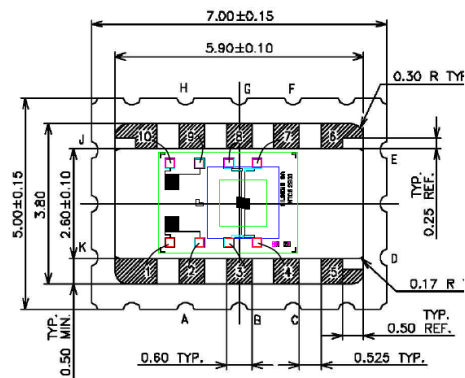
### Pin-out:

- $R_{t_1}$ : pin 1 and 2
- $R_{t_2}$ : pin 9 and 10
- $R_{m_1}$ : pin 4 and 7
- $R_{m_2}$ : pin 3 and 8
- NC: pin 5
- NC: pin 6

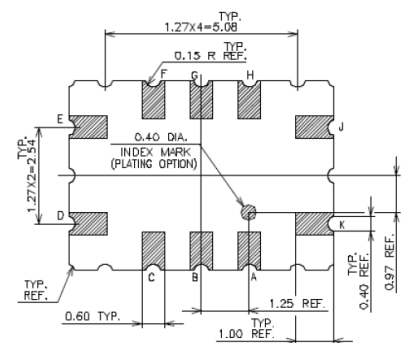
### Connection:

- (1-K) ; (2-A) ; (3-B), (4-C)
- (7-F) ; (8-G) ; (9-H) ; (10-J)

**Soldering information:** MAX: 250°C, 90 sec



Top View



Back side View

A specific PTFE filter can be added on the grid to avoid risk of water drops or oil drops onto the sensor for dirty environment conditions

**Parts exposed to gas:** aluminum, bulk silicon, silicon dioxide, silicon nitride, fused quartz, aluminum grid

## Ordering information

Part number	Description
MTCS2601	Sensor in LCC package with an anodized aluminum protective grid

Delivery: Tape and Reel 16 mm

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