ψ Edge Components

WS2024: Dual Nano-WO3-Based Gas Sensor with Integrated Micro-heater

Features

- Detection of multiple gases: Ammonia (NH_3), Nitrogen Dioxide (NO_2), and Ethanol (C_2H_6O)
- Two integrated gas sensors
- Integrated temperature sensor (aluminum resistor)
- Integrated thermal resistor (polysilicon heater)
- Compact and cost-effective design
- Low energy consumption
- Easy to integrate and use

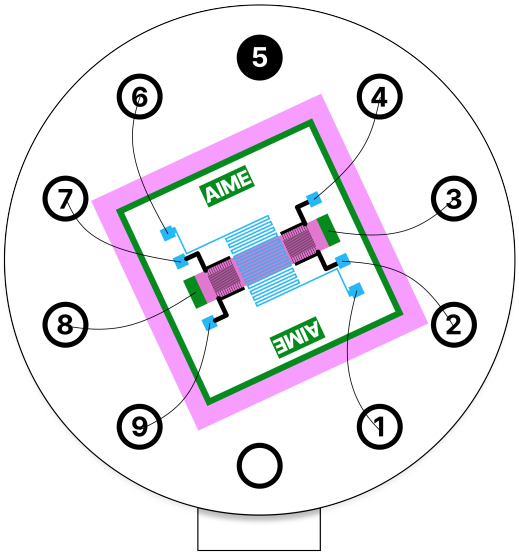

Figure 1: Schematic of the sensor

Description

The WS2024 gas sensor employs tungsten trioxide (WO_3) nanoparticles for detecting various gases with high sensitivity and selectivity. The sensor includes two active sensing areas, interdigitated aluminum comb electrodes, and an integrated n-doped polysilicon microheater for precise temperature control. An aluminum temperature sensor ensures real-time monitoring of the sensing area to optimize performance.

This is a compact and energy-efficient sensor delivers reliable operation across diverse environments. Its robust design supports applications like environmental monitoring, industrial safety, and automotive emissions detection, making it an ideal choice for modern gas sensing needs.

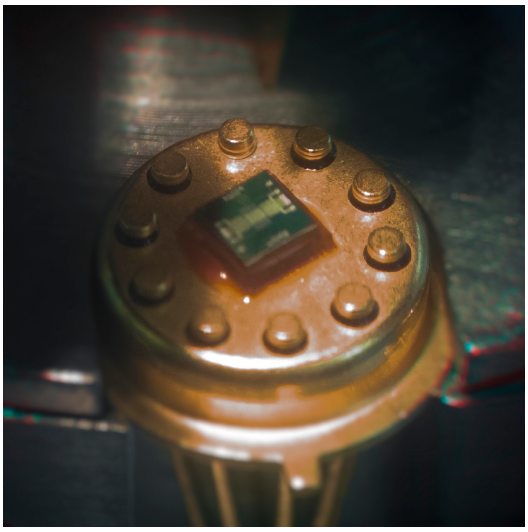

Figure 2: Gas sensor, without covering

Standard Applications

- Environmental monitoring
- Industrial safety systems
- Automotive emissions detection

Typical Application

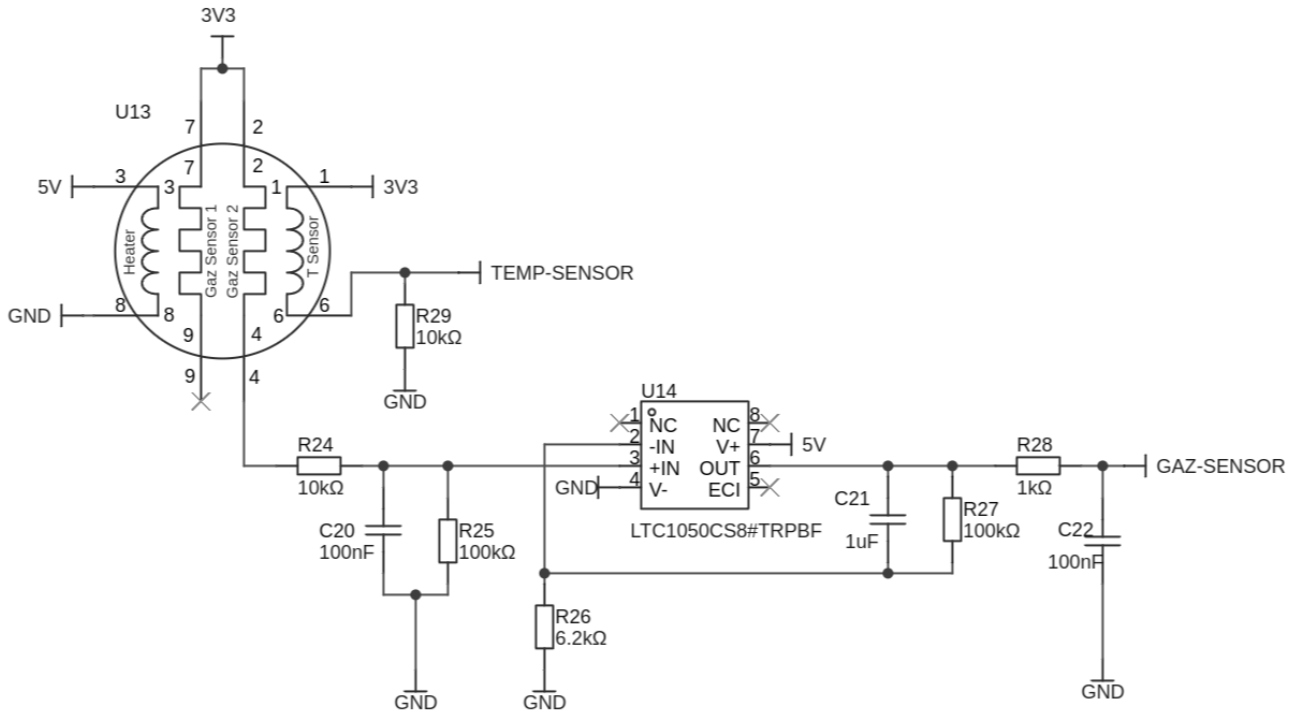

Figure 3: Typical Application

This circuit integrate the gas sensor into a standard amplifying measuring chain for a microcontroller. It is composed of three cascading filter: to filter the high frequency measuring noise, the 50 hz outlet noise and the sampling noise of the ADC. See **Fig. 8** for a typical output from this application.

Pin Configuration

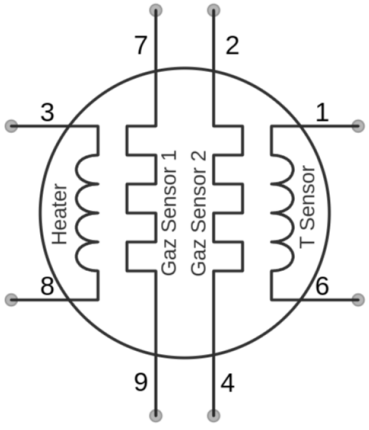

Figure 4: Sensor Pinout

Pin Number	Pin Function
1 & 2 & 7	3V3
3	5V
4	Gas Sensor
5 & 9 & 10	NC
6	Temperature Sensor
8	GND

Table 1: Pinout of the typical application

Absolute Maximum Ratings

All specifications are in $-40°C \leq T_A \leq 85°C$ unless otherwise noted.

Table 2: Electronic Specifications

Conditions	Parameter	Symbol	Min.	Typ.	Max.	Unit
Aluminium	R Aluminium	R_{alu}		90.1		Ohm
	D nominal	D_{nom}	0		5	V
	D non degrading	D_{nonDeg}	5		10	V
Polysilicon	R Polysilicon[1]	R_{poly}		79.1		Ohm
	D nominal	D_{nom}	0		5	V
	D non degrading	D_{nonDeg}	5		15	V
	Rcapteur	R_{capt}		20		GOhm

* Based on characterization data only.
[1] R_{Poly} is the resistance measured between PINS 1 & 6, acting as sensor measurand

Table 3: Sensitivity and Limit, under N_2O_2 first then CH_3CH_2OH

T(K)	DR/R0(%)	kN2O2-tN202	Sensitivity (Ohm/ppm)	Sensitivity limit (ppm)
550	55.70%	0.008	880000	246.59
T(K)	**DR/R0(%)**	**keth-teth**	**Sensitivity (Ohm/ppm)**	**Sensitivity limit (ppm)**
550	48.21%	0.007	810000	112.84

Typical Characteristics

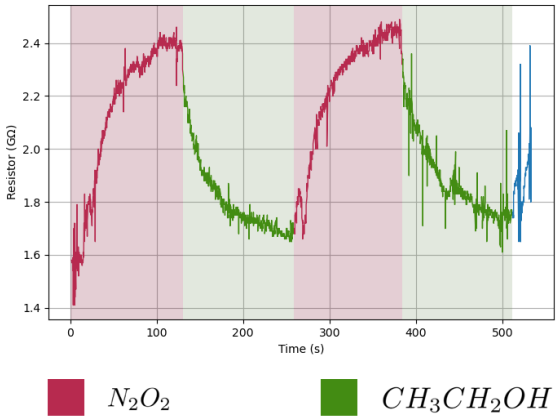

Figure 5: Resistor *(in $G\Omega$)* depending on the gas

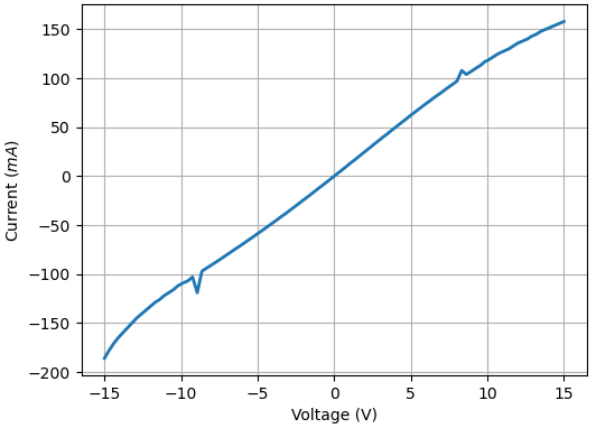

Figure 6: Current of R_{poly} *(in mA)* depending on the current *(in V)*

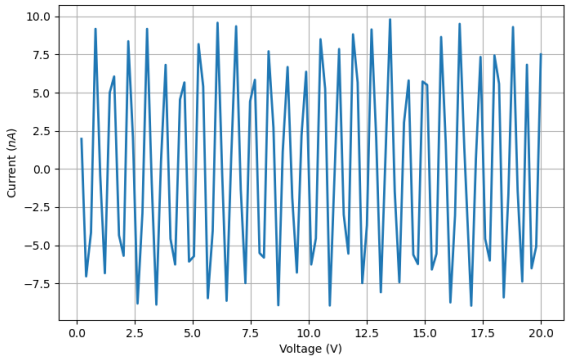

Figure 7: Comb[1]'s current *(in nA)* depending on the given voltage *(in V)*

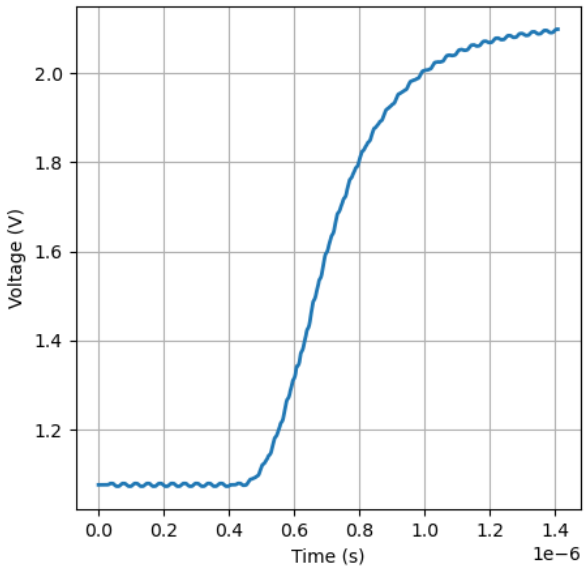

Figure 8: V_{out} from the typical application using *LTSpice*

[1]**Comb**: Resistor between pins 7 & 9 or 2 & 4. (see Fig. 1)

Dimensions

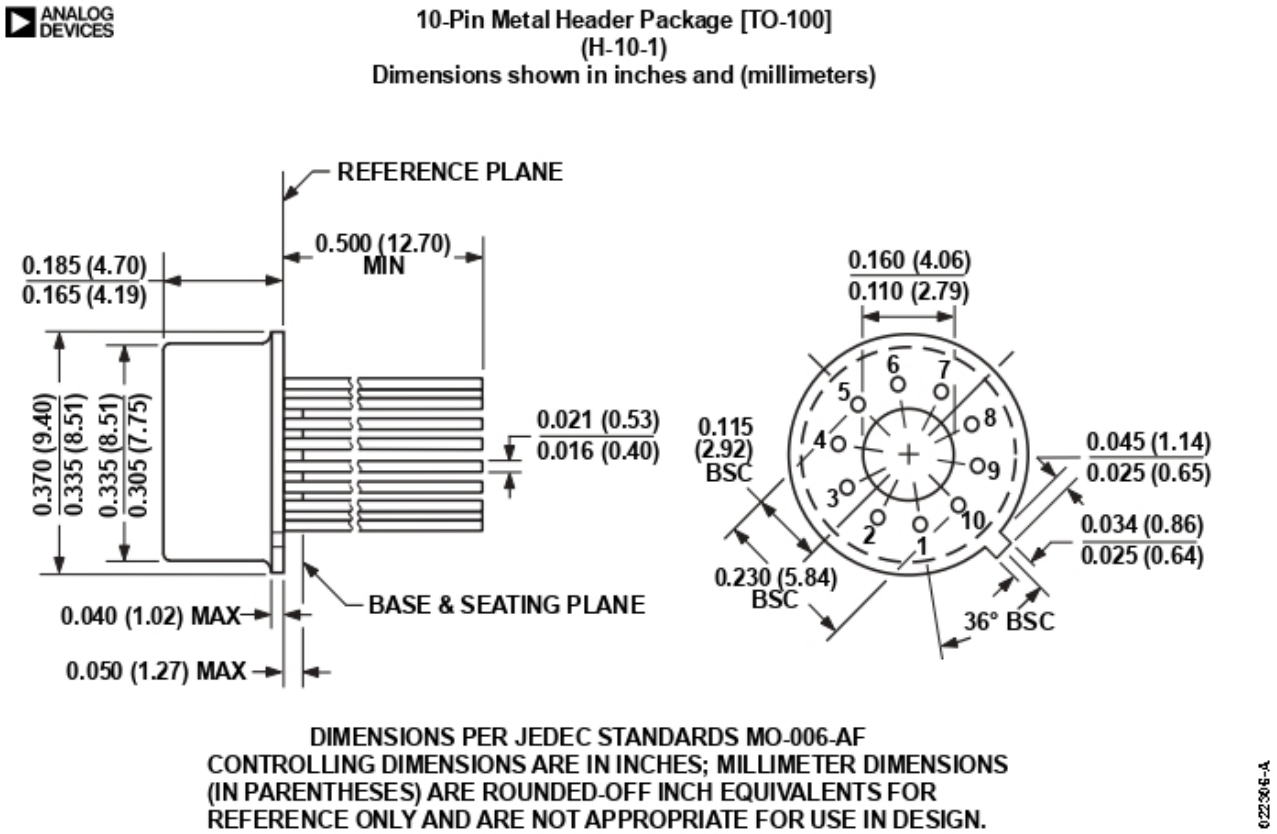

Figure 9: TO-100 Package with 10 pins