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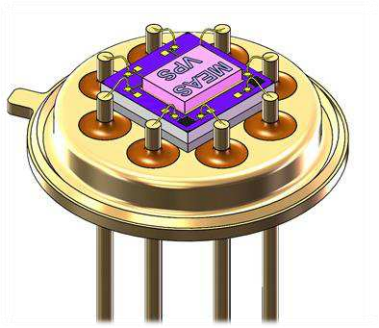


RoHS

VPS025A
VPS025P

Vacuum Pressure Sensor

Features

- Measuring range of atmosphere to 10^{-4} mbar
- Silicon Micromachining Technology
- TO-5 Housing
- Small Time Constant
- For use in reactive gas atmosphere there is a version with protective coating available

Applications

- Pirani Gauges
- Industrial Application
- Gas Analysis – Mass Spectrometry
- Vacuum Pumping Systems

Product Description

The sensor element consists of a silicon chip with a thin membrane approximately 1mm² in size of a material with extremely good electrical and thermal insulating properties. On the membrane are two thin film resistors (R_{m1}, R_{m2}) which are both used for heating the membrane and for measurement of membrane temperature T_m. The resistors are passivated to protect them from the effects of the gas. The membrane is completely covered by a second small silicon chip with a rectangular cavity etched in. The hollow space thus formed above the membrane is the thermal conductivity section. The gas comes to the measuring section through a small lateral opening in the membrane cover by diffusion only, and not by flow.

The sensor chip and its cover are attached to a silicon support which also permits gas exchange to the lower side of the membrane. The sensor is electrically connected to an eight-pin base by gold wire bonding.

Due to the residual gas surrounding the membrane, thermal energy is dissipated from the membrane held at higher temperature T_m. Measured is the signal needed in a temperature stabilization circuit to keep the excess temperature of the membrane ΔT constant.

On the solid part of the chip are two more resistors (R_{t1}, R_{t2}) to measure and compensate for the effect of the ambient temperature ϑ.

The die stack is mounted on top of a TO-39 header with welding projection flange to be welded directly inside a third-party housing.

For use in reactive gas atmosphere there is the version of VPS025P. The whole silicon stack is covered with a thin film of special coating to make it robust against silicon etching gases.

Specifications

Absolute Maximum Ratings

Heating power	P (R_{m1}+R_{m2})	max. 30 mW
Membrane temperature	T_M	max. +180 °C
Ambient temperature	ϑ	-20 °C to +85 °C

Recommended Operating Conditions

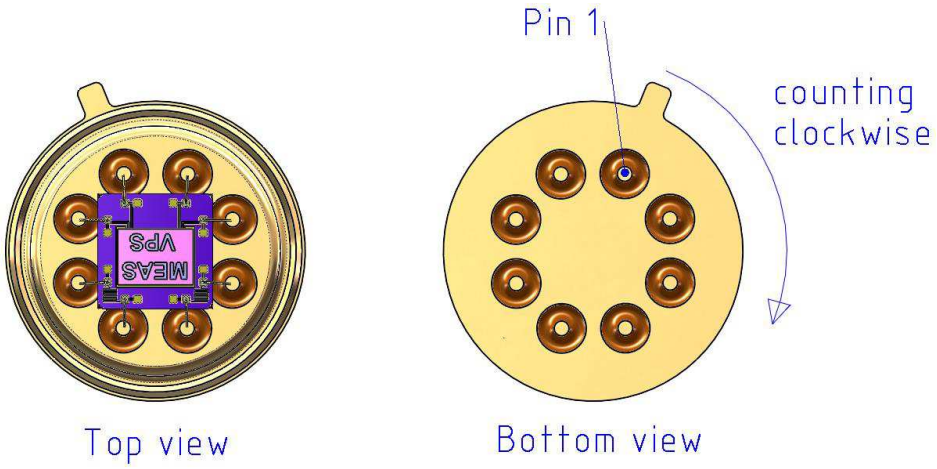
Heating power	P (R_{m1}+R_{m2})	5 mW
Membrane excess temperature	$\Delta T = T_M - \vartheta$	+50 °C

The minimum ΔT for any application is determined by the resolution of thermal conductivity λ required in combination with the noise of the amplifier circuit used. A very low ΔT has advantages in terms of linearity, low drift and better long-term stability of the sensor.

Parameter Specifications

Resistances Heater	R_{m1} ; R_{m2}	100 +15/-8 Ω	at +25 °C
Resistances Difference Heaters	R_{m1} - R_{m2}	+2.00 Ω	at +25 °C
Resistances Ambient Temperature Sensor	R_{t1} ; R_{t2}	240 +35/-20 Ω	at +25 °C
Resistance Ration	R_{tx}/(R_{m1}+R_{m2})	1.20 ± 0.07	x ∈ {1;2}
Temperature Coefficient of Resistance R_{tx} ; R_{mx}	α	5500 +400/-700 ppm/K	at 20 °C ↔ 100 °C
Geometry Factor	G	3.6 mm	The factor G is determined by the internal sensor geometry.
Membrane thermal time constant	τ_M	<5 ms	
Protective Coating Thickness		1.20 ± 0.12 µm	for G-VPSCO-004 “VPS025P” only
Non Coated Area		1.8 mm	pins from bottom of sensor base downwards; for G-VPSCO-004 “VPS025P” only
Distance between membrane and cover cap	$g_{VPS025A}$	24.0 ± 2.0 µm	for G-VPSCO-005 “VPS025A”
	$g_{VPS025P}$	21.6 ± 2.0 µm	for G-VPSCO-004 “VPS025P”
Sensor Dimension		3.5 mm × 3.5 mm × 1.2 mm	Die Stack (excluding Base)
		Ø9.13 mm × 16.5 mm	including Base
Base Material		Base material for the dies is silicon.	

Electrical Connections



Pin #	Description
1	Rm1
2	Rm2
3	Rt2
4	Rt2
5	Rt1
6	Rt1
7	Rm2
8	Rm1

Figure 1: Pin assignment of electrical connections to top and bottom view of sensor

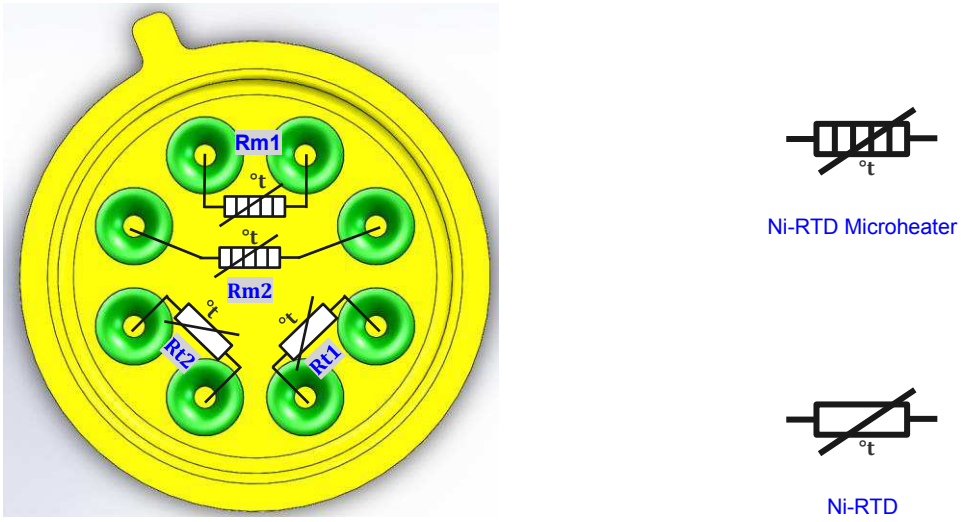


Figure 2: Equivalent Circuit Diagramm

Mechanical Dimensions

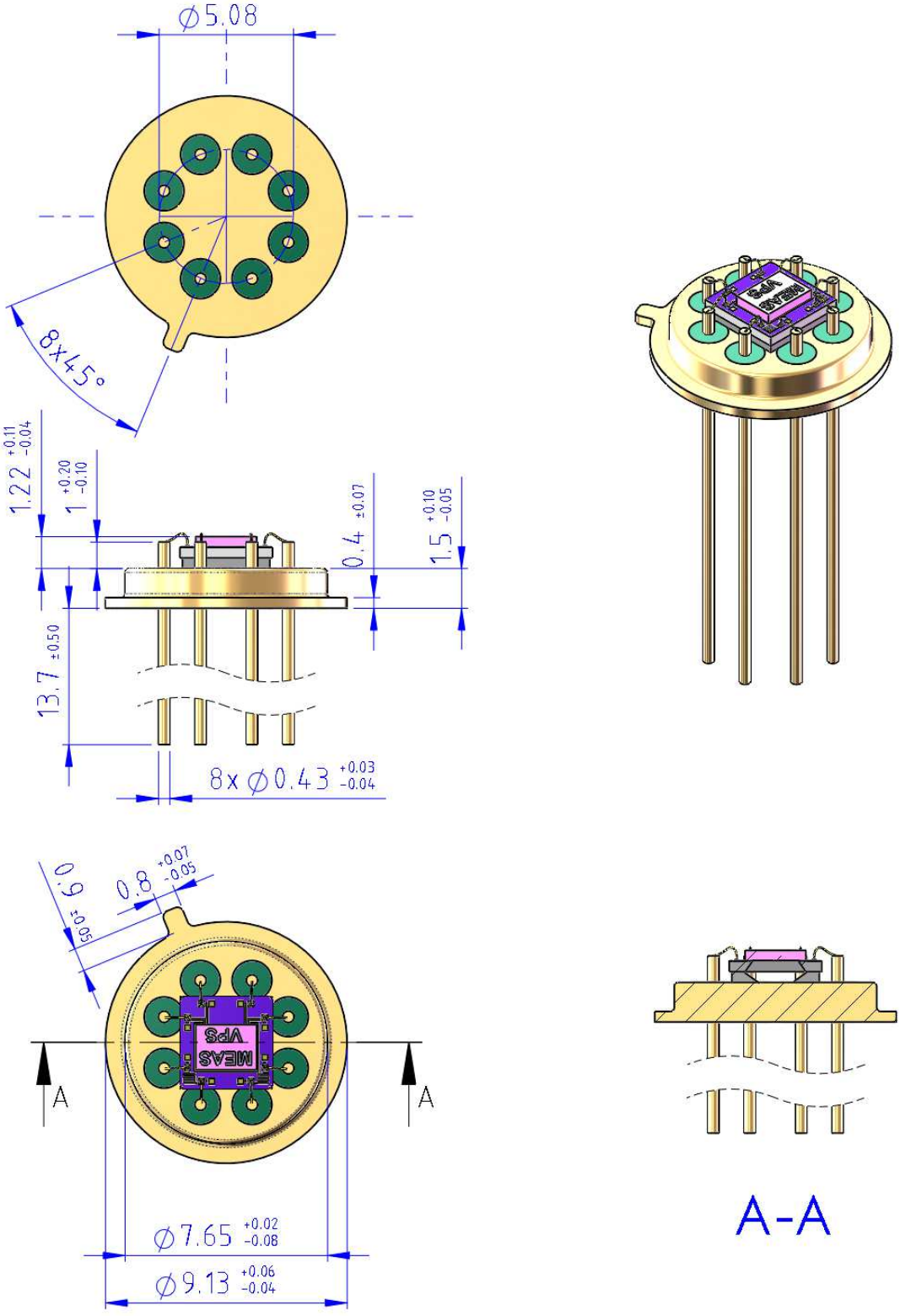


Figure 3: Mechanical dimensions of sensor – all dimensions in mm

Ordering Information

Description	Part Number
VPS025A	G-VPSCO-005
VPS025P	G-VPSCO-004

VPS025A is the standard version.

VPS025P is the version with protective coating.

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Version # MM/YYYY