

Pirani Vacuum Sensors

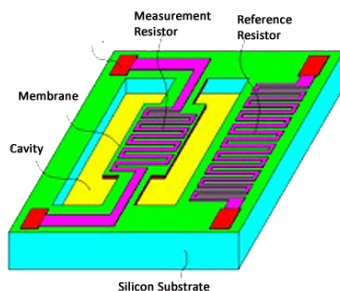
Description

Posifa's PVC1000 series of MEMS Pirani Vacuum Sensors offer a breakthrough vacuum measurement solution that enhances miniaturization while delivering ultra-low power consumption, long lifetime, minimal field maintenance, and low cost.

Based on the principal that the thermal conductivity of gases is proportional to pressure in the low vacuum range, the Posifa sensors measure minute changes in resistance to a heated element resulting from heat transfer to the surrounding gas.

The heated element (i.e. measurement resistor) consists of a platinum thin-film resistor residing on a thermal insulating membrane. The membrane is suspended over a micro-machined cavity that is 25 μm in depth and has a bottom surface that is parallel to the membrane, ensuring precision measurement of heat transfer. Due to the minute volume of the gas measured (i.e. the volume within the cavity), the Posifa sensors deliver ultra-low power consumption and fast response time.

The Posifa sensors also provide a reference resistor of the same Thermal Coefficient of Resistance (TCR) as the measurement resistor, residing on the sensor die substrate. It can be used by the sensor circuitry for ambient temperature compensation.



The miniaturization of the Pirani technology using MEMS is emerging as an industry standard due to reliability, low cost, ease of use and ultra-low power consumption. Posifa's PVC1000 series of MEMS Pirani Vacuum Sensors help customers leverage this trend to improve their existing products and to develop innovative new products.



Features

- Ultra low power consumption < 5 mW
- Fast Response Time < 5 mSec
- Shock Resistance to 1,000g
- Suitable for gas volume as low as 0.1 cm^3
- Low Noise
- High Resolution
- On-chip temperature sensing
- Long Term Stability
- Can be cleaned by immersing in solvent, prolonging useful life

Applications

- Analytical instruments
- Leak detection in any closed system maintained under primary vacuum
- Semiconductor equipment
- Vacuum packing machines
- Portable digital vacuum gauges
- Small mechanical systems (e.g. pumping) to achieve specified vacuum levels
- Low cost vacuum switches to verify vacuum below 1 torr

Absolute Maximum Ratings

- Operating Temperature: -40 $^{\circ}\text{C}$ to 125 $^{\circ}\text{C}$ (higher temperature versions available)
- Humidity: 0 to 100% RH, non-condensing
- Shock: 1000g
- Overpressure: 27.5 Bar

ELECTRICAL CHARACTERISTICS					
Test Conditions: Heating Current = 7 mA, Ta=25°C					
PARAMETERS	PVC1001			UNIT	CONDITIONS
	MIN	TYP	MAX		
Range	10 ⁻³		30	Torr	
Resolution ¹		0.25		Torr	5-30 Torr
		0.05		Torr	2 to 5 Torr
		0.005		Torr	10 ⁻³ to 2 Torr
Accuracy ¹		±10		% reading	> 5 Torr
		±5		% reading	< 5 Torr
Measurement Resistor ²	110	130	160	Ohm	At 25°C
Reference Resistor ²	210	260	300	Ohm	At 25°C
Resistor TCR		0.0025		/°K	
Humidity	0		100	%	RH, Non-condensing
Heating Current		7	7.5	mA	
Operating Temperature Range	-40		85	°C	
Power Consumption			5	mW	10 ⁻³ to 30 Torr
Shock Resistance			1000	g	
Overpressure			27.5	Bar	
Measurable Gas Volumes		0.1		cm ³	
Response Time		5		mSec	

Notes:

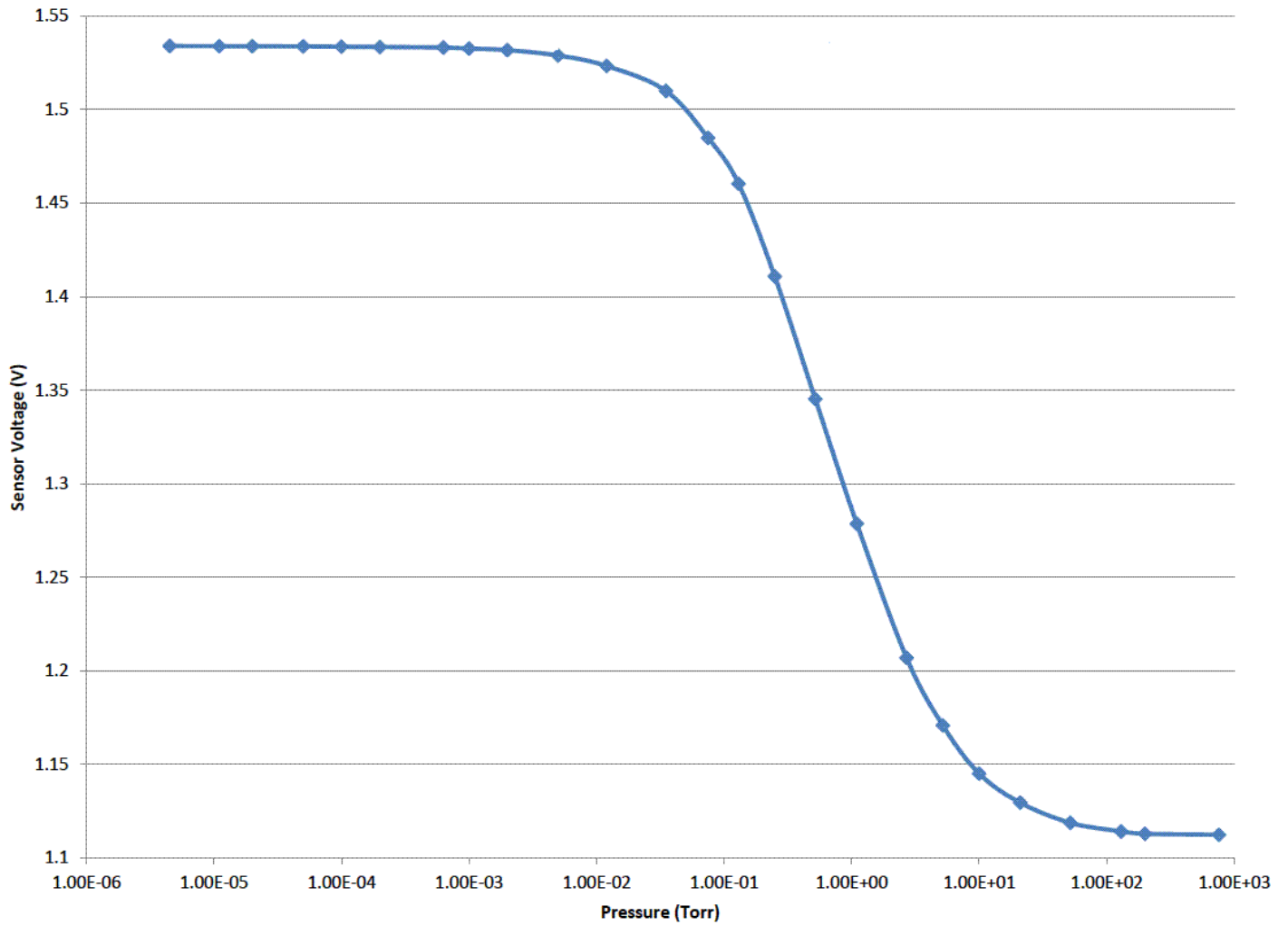
1. For reference only. Actual resolution/accuracy depends on the associated circuit.
2. Tighter resistance ranges are also available.

Output Voltage vs. Vacuum

Heating Current = 7 mA

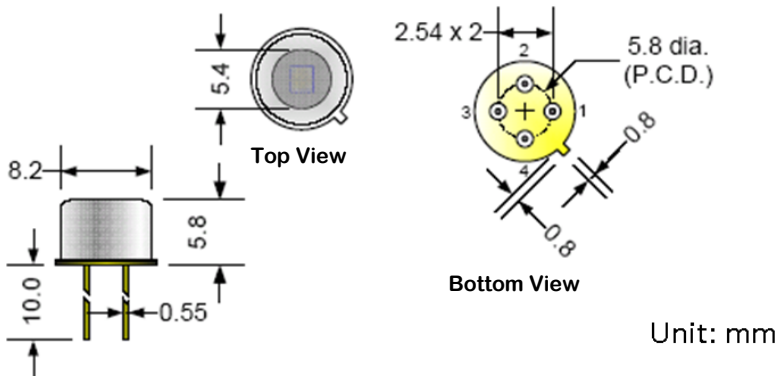
Ta = 25 °C

Measurement Resistor = 160 ohm



Package Dimensions

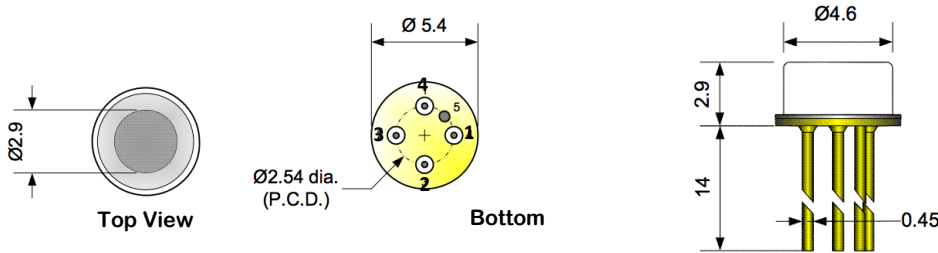
TO5 Package



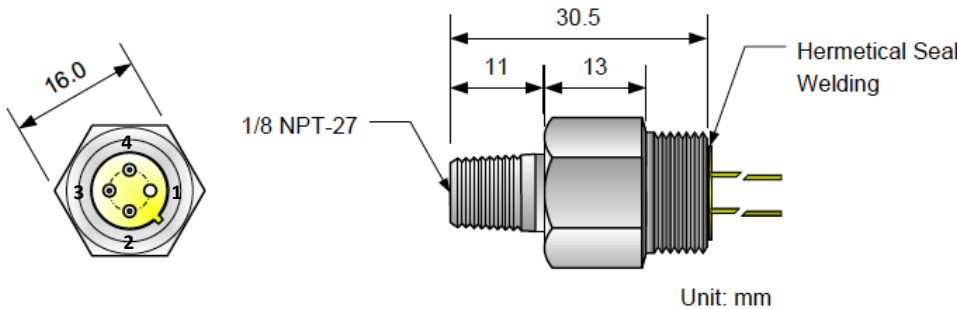
Pin #	Description
1	Measurement Resistor +
2	Measurement Resistor -
3	Reference Resistor +
4	Reference Resistor -

Unit: mm

TO46 Package



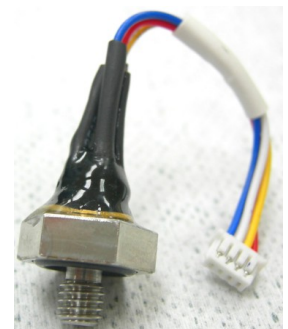
Threaded Package



Unit: mm

Custom Packaging

Pirani sensors often require unique packaging to accommodate the diverse applications into which they can be used. Posifa offers design services to customize the packaging of the sensors element, including the necessary cabling and connectors as specified by our customers.



Example: Custom Package

Ordering Information

Part Number	Specifications
PVC1001	10 ⁻³ to 30 Torr; TO5 metal can package
PVC1002	10 ⁻³ to 30 Torr; Bare die
PVC1003	10 ⁻³ to 30 Torr; Threaded package
PVC1004	10 ⁻³ to 30 Torr; TO46 metal can package
PVC1999	10 ⁻³ to 30 Torr; Custom package