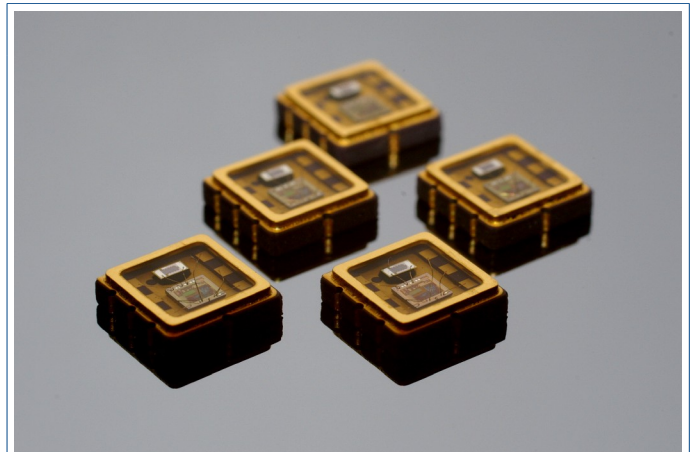


Capacitive Pressure Sensors

Main Features

- micro machined capacitive sensor element
- poly-silicon membrane on fused silica substrate
- very small chip size: 1.2mm x 0.6mm x 0.5 mm
- 2 measurement ranges: 0.3 - 1.3 bar and 2 - 8 bar
- high sensitivity
- minimum hysteresis
- low power consumption
- customized products
 - bare dies
 - sensor in SMD package
 - calibrated sensor systems
- applications, e.g.
 - barometric pressure measurement
 - medical implants



Pressure sensor with ASIC in a 5x5mm² package

General Description

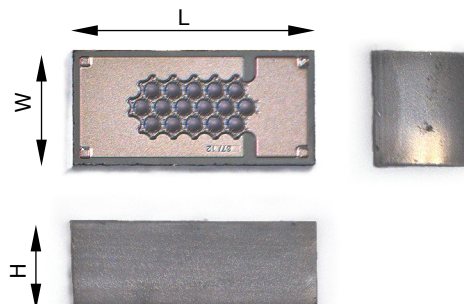
Protron's absolute pressure sensor consist of an ultra small capacitor array with 16 deformable poly-silicon membranes on top of insulated bottom electrodes. The non-conducting fused silica material minimizes all parasitic capacitances to the substrate. The sensor design ensures a high sensitivity, minimum hysteresis and a very low power consumption compared to piezo-resistive pressure sensors.

The dielectric insulation between the electrodes allows the sensor to be operated in normal mode for barometric measurements (typical range 0.3 - 1.3 bar) or in touch mode for high pressure measurements (typical range 2 - 8 bar).

Protron offers the pressure sensors as bare dies with or without package and as calibrated sensor systems with sensor chip and ASIC in a ceramic package. Furthermore evaluation boards for test purposes are available.

Dimensions of Capacitive Sensor Die

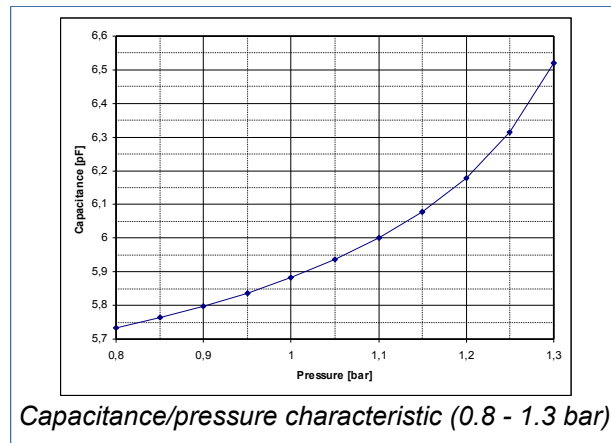
width	W = 0.6 mm
length	L = 1.2 mm
height	H = 0.5 mm
bond pad length	L _{BP} = 210 μm
bond pad width	W _{BP} = 530 μm
bond pad pitch	D _{BP} = 960 μm
topography on die	H _{BP} < 5 μm
sensitive area length	L _S = 690 μm
sensitive area width	W _S = 370 μm
bond pad material	aluminum (gold possible)



Pressure sensor die

Specifications of Sensor Die

Barometric pressure range	0.3 - 1.3 bar
pressure range	$P_{ref} = 1.0 \text{ bar}$
reference pressure	$T = -40...+85 \text{ }^\circ\text{C}$
temperature range	$C_{ref} = \text{approx. } 6 \text{ pF}$
capacitance @ P_{ref}	$S = \text{ca. } 1 \text{ fF/mbar}$
sensitivity @ P_{ref}	
High pressure range	
pressure range	2 - 8 bar
reference pressure	$P_{ref} = 4 \text{ bar}$
temperature range	$T = -40...+85 \text{ }^\circ\text{C}$
capacitance @ P_{ref}	$C_{ref} = \text{ca. } 10 \text{ pF}$
sensitivity @ P_{ref}	$S = \text{ca. } 1 \text{ fF/mbar}$

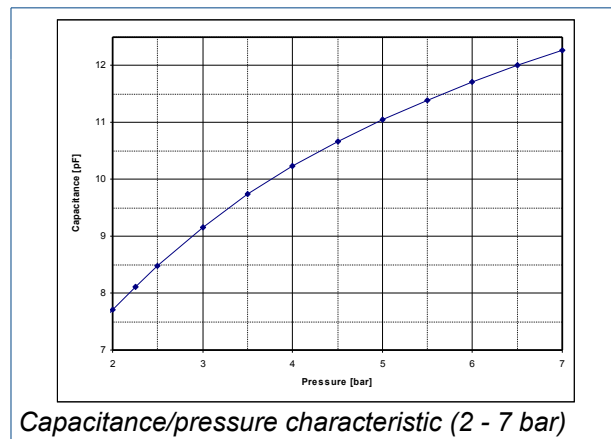


Capacitance/pressure characteristic (0.8 - 1.3 bar)

Pressure Sensor Systems

Protron developed two sensor systems with capacitance-to-digital converters and I²C digital output. An evaluation board with a 24 bit high resolution AD7745 ASIC from Analog Devices and a sensor system in a 5x5mm² ceramic package with 14 bit analog-to-digital converter.

Typical parameters for barometric pressures:	
pressure range	0.3 - 1.3 bar
resolution @ 1bar	+/- 0.05 mbar
absolute accuracy	+/- 1 mbar

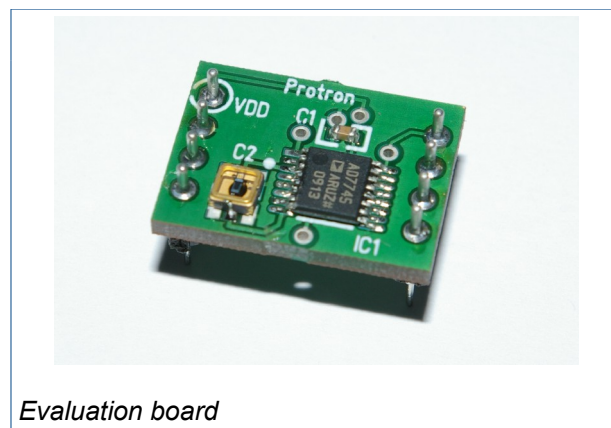


Capacitance/pressure characteristic (2 - 7 bar)

Protron offers

- capacitive sensor dies
- sensors dies in ceramic package
- evaluation board with 24 bit AD7745 ASIC and micro controller board with test software
- sensor system with 14bit ASIC in ceramic package

Protron offers customized developments based on the current sensor design, e.g. for low power and high resolution applications or for medical use.

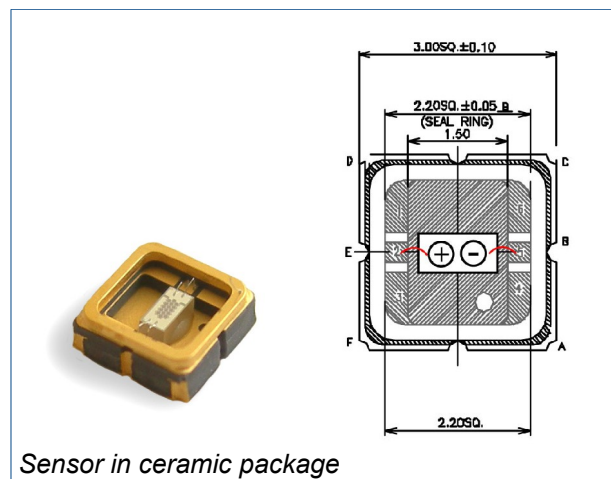


Evaluation board

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Sensor in ceramic package