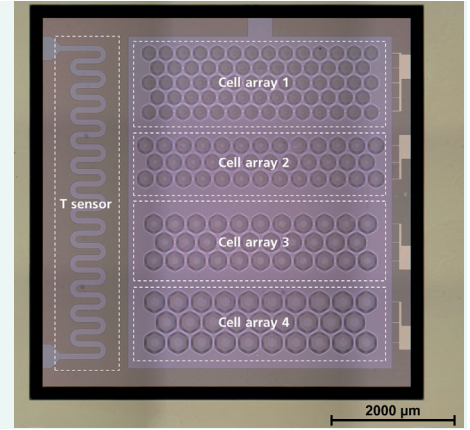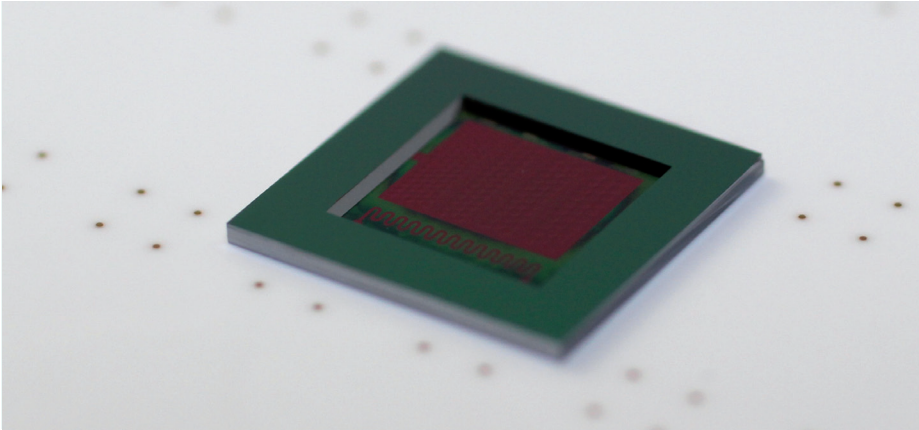# MULTIFUNCTIONAL MEMS WITH ULTRASONIC TRANSDUCER AND TEMPERATURE SENSOR

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Figures:

left: Multifunctional MEMS on ceramic substrate with vertical interconnects.
right: Microscopic image of sensor structure.

Photo acknowledgments: Fraunhofer ENAS
All information contained in this datasheet is pre-liminary and subject to change. Furthermore, the described systems, materials and processes are not commercial products.

Micromachining of ultrasonic transducers can provide large arrays of single cells with accurate dimension control and reliable interconnections on wafer-level. Especially in fluid mediums, silicon-based ultrasonic transducers possess high transduction efficiency. With these advantages both in fabrication and device properties, a wide range of applications are possible. Depending on the size of the ultrasonic cells, they are also applicable for pressure sensing. The multifunctional MEMS device contains four cell arrays that can be actuated separately and used for pressure sensing, ultrasound sending, ultrasound receiving or any combination. In addition, a platinum-based resistive temperature sensor is integrated.

Features

- Electrostatic actuation, capacitive detection
- Both in air and water operable
- Suitable for array operation
- Cheap, robust, reliable

Application fields

- Non-destructive test of materials, components etc.
- Autonomous robots
- Medical diagnostics
- Phased-array acoustic imaging
- Proximity sensors
- Fluid metering (level, flow rate)

Technical Parameters

Typical product size (L x W x H)	10 x 10 x 1 mm³
Functions	Ultrasound sender, ultrasound receiver, temperature sensing, pressure sensing
Number of cell arrays	4
Membrane material	SiO_2-Si_3N_4-Pt-SiO_2
Electrode material	Platinum
Resonance frequency	1 MHz
Temperature sensor	Pt100, integrated
Packaging	WLP, all silicon or bonded to ceramic (LTCC)

Parameters can be changed according to customer requirements.