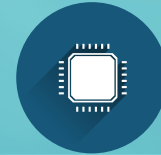![Fraunhofer ENAS logo]

Component

Capacitive Micromachined Ultrasonic Transducers (CMUT)

Fast Facts

- Wide frequency bandwidth
- Good acoustic matching
- Wide operation temperature range
- No self-heating
- High yield fabrication
- Use of standard silicon processing
- Design flexibility
- Integration with CMOS (driving electronics)

General Description

Capacitive Micromachined Ultrasonic Transducer (CMUT) is an alternative technology to bulk piezo-based transducers, for generating and receiving ultrasound waves. CMUT is fabricated in silicon MEMS processes, can be highly miniaturized, inexpensively manufactured in batch processes and integrated with its driving electronics. CMUT has low acoustic impedance and wide frequency bandwidth and its performance is stable over a large operating temperature. These advantages have made CMUTs superior to bulk piezo-based transducers and opened up new application opportunities for them.

Features

- Miniaturized
- Suitable for operation in air and fluid
- Suitable for operation in harsh environment
- Low power consumption
- RoHS compliant

Suggested Applications

- Non-destructive testing
- Medical diagnostics and therapy
- Photoacoustic imaging
- Proximity sensors
- Gas flow sensors
- Chemical sensors
- Fluid metering (level, flow rate)

Silicon Micromachined Ultrasonic Transducer.
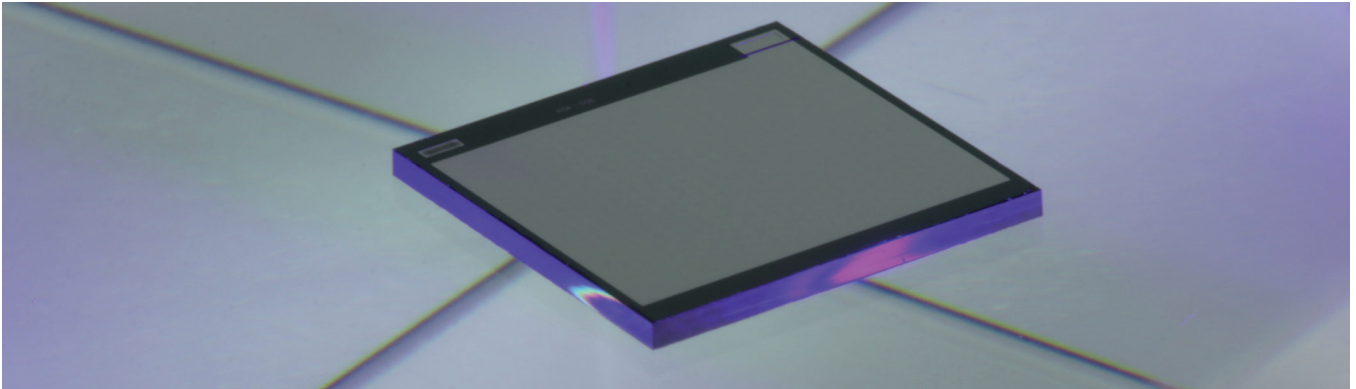
CMUT (10 x 10 mm²).

Technical Parameters

Fabrication Technology	Wafer Bonding
Wafer size	6" (also possible in 8")
Number of die per wafer	Layout and wafer size dependent (e.g. 1000)
Number of elements per die and CMUT cell in each die	Application dependent
Transducer (die)size	Application dependent (e.g. 3 mm x 3 mm)
CMUT cell diameter	10 µm – 500 µm
Membrane thickness	Up to 10 µm
Cavity depth	Design dependent e.g. from below 1 µm to 3 µm
DC bias voltage	Design dependent e.g. 10 V to 100 V
AC excitation voltage	Design dependent e.g. 10 V to 100 V
Frequency range	Design dependent e.g. from below 1 MHz up to 15 MHz
Acoustic power	Design dependent
Packaging	Customized for application (e.g. for operation in harsh environment)

Parameters can be changed according to custom requirements.

In cooperation with

ZfM
Zentrum für Mikrotechnologien

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