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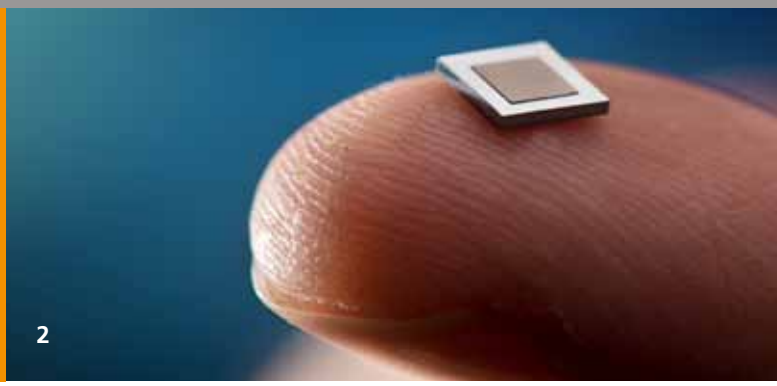
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1 *Micropump for use in smartphones*
2 *Silicon micropump, 5 x 5 mm²*

MICROPUMP FOR EMPOWERING SENSORS IN MOBILE DEVICES

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Applications

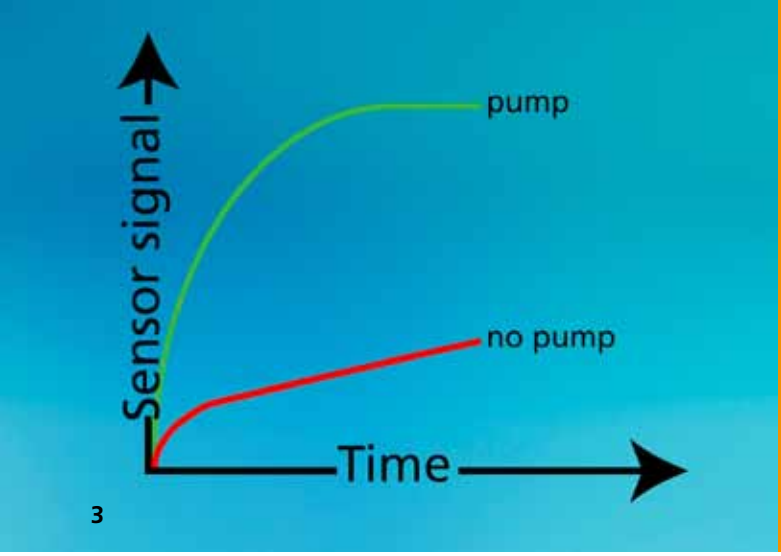
Many smartphones already comprise sensors for environmental parameters like CO_2, humidity or temperature. A small micropump supplying the sensors within the mobile device with ambient air can reduce the sensor response time significantly and improve the measurement results. The heart of the micropump enabled sensor system is the piezo actuated micro diaphragm pump made of silicon. The micropump can handle a wide range of liquids and gases (e.g. for gas analysis, scent dosing and medical applications). The small size and low power consumption make applications in mobile devices feasible. Due to the silicon technology the device is very stable over time and inert to all kinds of gases and most liquids. A demonstrator for gas sensors in smartphones was already realised and shows excellent results.

Application potential

Gas sensors:
- CO_2
- alcohol
- volatile organic compounds (VOC)
- ozone
- environmental gases (e.g. NO_x)

Particle sensors:
- fine dust
- allergenes

Further applications:
- scent dosing
- medicals (e.g. breath analysis)
- micro pneumatic actuator for optical applications
- haptic displays



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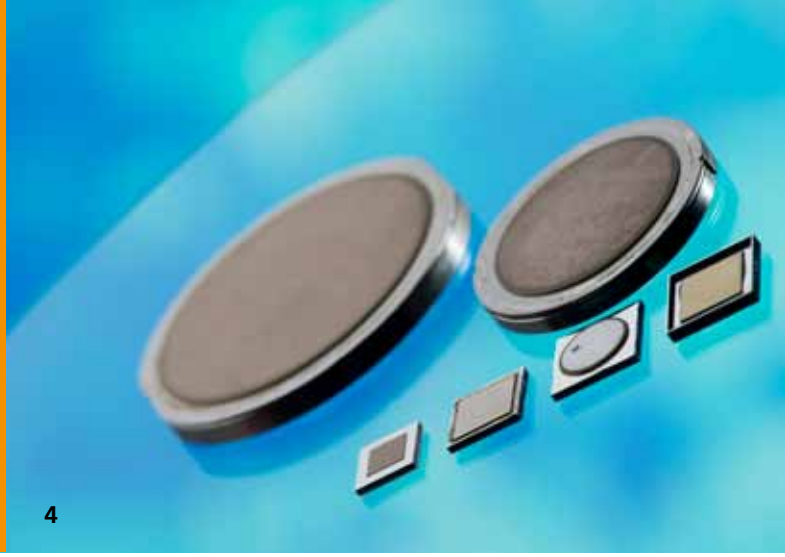

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Technical innovation

- Micropump feeds ambient air to sensor @ 10 mm³/sec
- Factor of at least 20x improvement in sensor reaction time (see figures)
- Enables fast detection of any gases in small and/or mobile devices
- Energy efficient actuator for mobile devices (power consumption around 8 mW on full operation)
- Cost efficient in mass production
- Small size: 5 x 5 x 0,6 mm³ (3,5 x 3,5 mm² under development)
- Feeds & regenerates multi sensor array

Outlook

- Shrink Roadmap towards smaller footprint (e.g. 3,5 x 3,5 mm²)
- Development of packaging & testing for mass production
- Integration with flow measurements and multiple sensor arrays

Technical data

Overview about characteristic values of different silicon micro membrane pumps developed at Fraunhofer EMFT:

Pump type		µP015v1	µP024Av2	µP026v1
		silicon	silicon	silicon
Weight	g	0,07	0,06	0,03
Size	mm³	7x7x0,8	7x7x0,7	5x5x0,6
Stroke volume	nl	80	140	50
Max. back pressure (air)	kPa	90	80	30
Max. suction pressure (air)	kPa	-50	-50	-20
Max. back pressure (fluids)	kPa	550	140	80
Max. flowrate (air)	µl/min	500	1.000	600
Max. flowrate (fluids)	µl/min	150	300	60

3 *Schematic measurement graph*

4 *Pump family, silicon and metal*