

1 Micropump for use in smart-phones

2 Silicon micropump, 5 x 5 mm<sup>2</sup>

## MICROPUMP FOR EMPOWERING SENSORS IN MOBILE DEVICES

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### Applications

Many smartphones already comprise sensors for environmental parameters like CO<sub>2</sub>, 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:

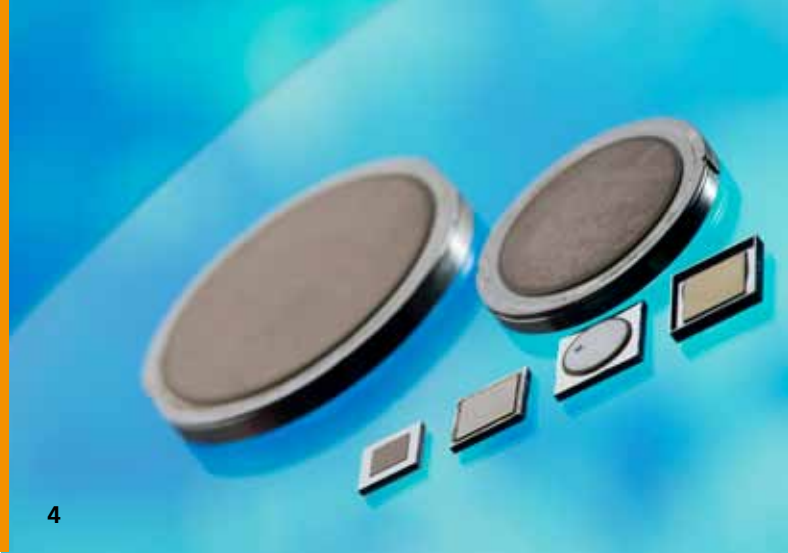
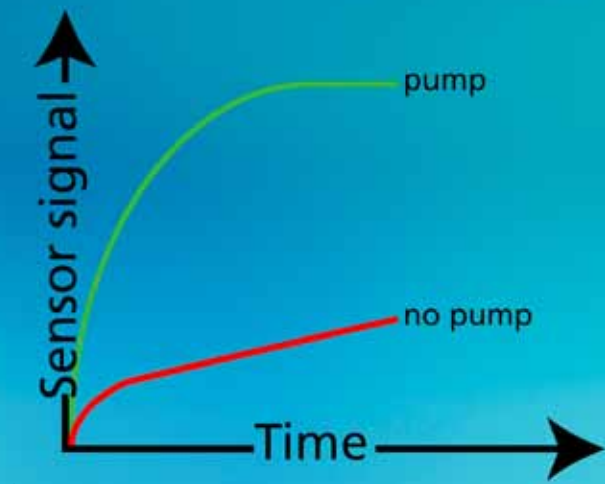
- CO<sub>2</sub>
- alcohol
- volatile organic compounds (VOC)
- ozone
- environmental gases (e.g. NO<sub>x</sub>)

Particle sensors:

- fine dust
- allergenes

Further applications:

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



### Technical innovation

- Micropump feeds ambient air to sensor @ 10 mm<sup>3</sup>/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 mm<sup>3</sup> (3,5 x 3,5 mm<sup>2</sup> under development)
- Feeds & regenerates multi sensor array

### Outlook

- Shrink Roadmap towards smaller footprint (e.g. 3,5 x 3,5 mm<sup>2</sup>)
- 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
<b>Weight</b>	g	0,07	0,06	0,03
<b>Size</b>	mm <sup>3</sup>	7x7x0,8	7x7x0,7	5x5x0,6
<b>Stroke volume</b>	nl	80	140	50
<b>Max. back pressure (air)</b>	kPa	90	80	30
<b>Max. suction pressure (air)</b>	kPa	-50	-50	-20
<b>Max. back pressure (fluids)</b>	kPa	550	140	80
<b>Max. flowrate (air)</b>	μl/min	500	1.000	600
<b>Max. flowrate (fluids)</b>	μl/min	150	300	60