



## Product brief

# XENSIV™ environmental sensor

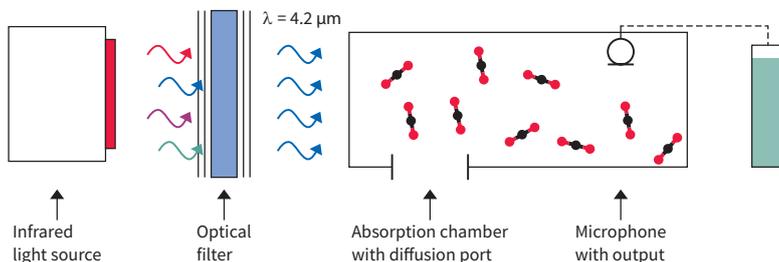
## CO<sub>2</sub> PAS sensor based on the photoacoustic principle

The XENSIV™ CO<sub>2</sub> PAS sensor is a real carbon dioxide (CO<sub>2</sub>) sensor in an unprecedented small form factor. Designed on the basis of a unique photoacoustic spectroscopy (PAS) concept, the sensor saves more than 75 percent space compared to existing commercial real CO<sub>2</sub> sensors. Its direct ppm readings, SMD capability and simple design allow for a quicker and easier integration into customers' systems in low and high-volume applications alike.

The photoacoustic principle can be traced back to over 100 years ago and was first discovered by Alexander Graham Bell in 1880. The photoacoustic effect involves the formation of sound waves (pressure changes) following light absorption in a material sample. The sound signal is quantified by detectors, such as microphones. In order to obtain this effect, the light intensity must vary. A PAS gas sensor is based on the principle that gases absorb light in a specific wavelength of the infrared spectrum. CO<sub>2</sub> molecules, for example, have strong absorption in the  $\lambda = 4.2 \mu\text{m}$  wavelength.

The CO<sub>2</sub> PAS sensor module integrates on the same PCB, the photoacoustic (PAS) transducer, a microcontroller for signal processing, algorithms and a MOSFET. As depicted in the block diagram, the PAS transducer includes: i) a proprietary infrared emitter with blackbody radiation which is periodically chopped by the MOSFET, ii) a narrow-band optical filter passing the CO<sub>2</sub> specific wavelength  $\lambda = 4.2 \mu\text{m}$ , significantly improving the sensor selectivity compared to other gases, including humidity, iii) and Infineon's high-SNR (Signal-to-Noise Ratio) MEMS microphone XENSIV™ IM69D130, detecting the pressure changes generated by the CO<sub>2</sub> molecules. All the components are developed and designed in-house in accordance with Infineon's high-quality guidelines. The sensor therefore benefits from Infineon's illustrious record of accomplishments in MEMS design and acoustic capabilities, leading to the best-in-class price/performance CO<sub>2</sub> sensor.

The CO<sub>2</sub> PAS sensor is ideal for smart-home and building automation as well as various indoor air quality IoT devices such as air purifiers, thermostats, weather stations and personal assistants. The sensor enables end users to track, understand and improve the air quality surrounding them in a timely and highly energy-efficient manner.



### Key features

- > Unprecedented small form factor in an SMD module
- > ppm reading of the CO<sub>2</sub> level
- > Operating range
  - CO<sub>2</sub>: 0 ppm to 10,000 ppm
  - Temperature: 0 °C to 50 °C
- > Supply voltage
  - VDDIO = 3.3 V
  - VDD12 V = 12 V
- > Interface: UART, I<sup>2</sup>C, PWM

### Benefits

- > Saves space in customers' end products
- > Accurate and robust performance
- > Easy-to-integrate SMD module
- > On-board processing with the integrated microcontroller
- > Manufacturing scalability

### Applications

- > Ventilation control/building automation
- > Smart appliances such as air purifiers, air conditioners
- > Consumer devices for air quality monitoring, such as thermostats, weather stations and personal assistants
- > Smart indoor lighting
- > In-cabin air quality monitoring