

XENSIV™ PAS CO2 5V sensor

Measure what matters for improved comfort, wellbeing and greater energy efficiency

Infineon has leveraged its know-how and state-of-the-art capabilities in sensors and MEMS technology to develop a 5 V disruptive carbon dioxide (CO₂) sensor. Monitoring CO₂ levels is crucial to ensure good indoor air quality and the integration of the XENSIV™ PAS CO2 5V sensor into a ventilation device help maintain the ideal indoor environment by optimizing wellbeing, comfort and energy efficiency.

By leveraging photoacoustic NDIR sensing principle, XENSIV™ PAS CO2 5V addresses the limitations in size, performance and assembly faced by conventional CO₂ sensor solutions. The XENSIV™ PAS CO2 5V comes in an exceptionally miniaturized module (14 x 13.8 x 7.5 mm³) that is four times smaller and three times lighter than its NDIR counterparts. This enables more than 75 percent space-saving in customer applications. In addition to its compact design, the XENSIV™ PAS CO2 5V delivers high data quality and meets the performance criteria of WELL™ Building Standard.

All major components of XENSIV™ PAS CO2 are developed in-house according to Infineon's high-quality standards. This includes a dedicated microcontroller, which runs advanced compensation algorithms to deliver direct and reliable ppm readouts of real CO₂ levels. The available configuration options make the sensor one of the most versatile plug-and-play CO₂ sensors on the market. These options include: dedicated ABOC (Automatic Baseline Offset Calibration), pressure compensation, signal alarm, sample rate and early measurement notification, which are mainly useful for power consumption management. The SMD package, delivered in tape and reel, facilitates ease of assembly, even in high-speed, high-volume manufacturing.

XENSIV™ PAS CO2 5V seamlessly integrates into a wide range of commercial and residential applications such as building automation, smart home technology and air quality monitoring. In HVAC (Heating, Ventilation and Air Conditioning) systems, the CO₂ sensor ensures optimal indoor air quality, improved energy efficiency and lower energy bills. By enabling DVC (Demand Controlled Ventilation), the CO₂ sensor data automatically adjust the room ventilation rate when the CO₂ concentration reaches defined thresholds optimizing the supply of fresh air based on real-time occupancy. This results in substantial energy and cost savings.

Its compact size makes the XENSIV™ PAS CO2 5V an excellent choice for smart home devices and IoT applications, too including air purifiers, thermostats, smart lighting systems, air quality monitors and smart speakers.

A complete suite of boards, libraries and application notes will be available to support customers in accelerating their design-to-market.

Key features

- Miniaturized form factor (14 x 13.8 x 7.5 mm³)
- 5 V power supply (IR emitter)
- SMD package delivered in tape and reel
- High accuracy (±50 ppm ±5% between 400 and 3,000 ppm)
- Advanced compensation and self-calibration algorithms
- Three interface options: UART, I²C, PWM
- Design proven against dust in compliance with ISO 20653:2013-02

Key benefits

- Space saving for easy integration
- Smooth high-volume assembly
- High-quality data for real-time monitoring
- Maintenance-free for user convenience
- Long-term stability for reliable and consistent performance
- Seamless communication thanks to different interfaces
- Robustness and durability
- Dust-resistant device
- Compliance with WELL™ Building Standard



PRODUCT BRIEF

Photoacoustic principle: How does it work?

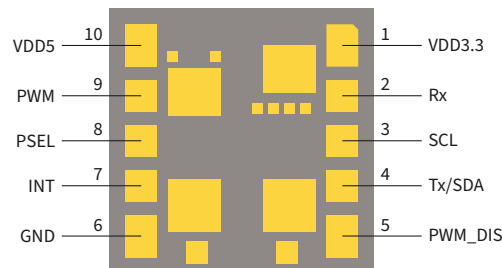
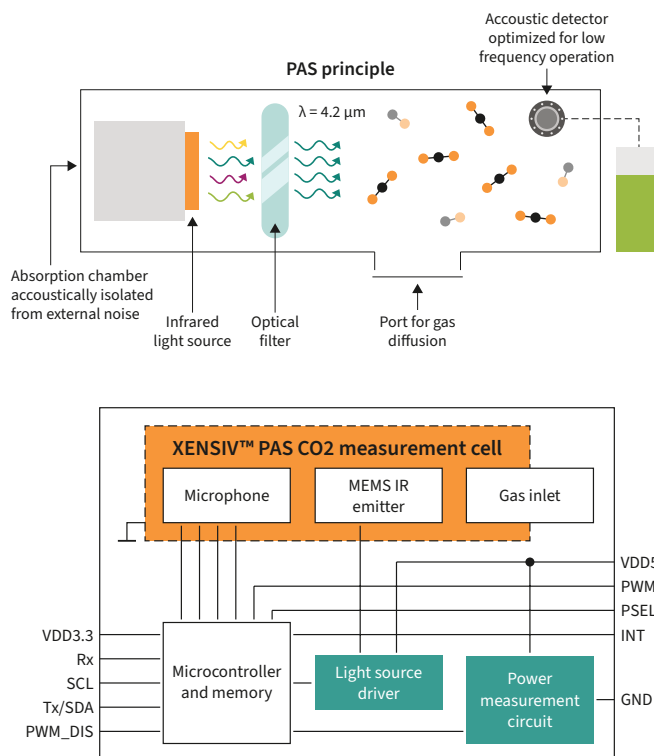
Pulses of light from an infrared source pass through an optical filter tuned specifically to the CO₂ absorption wavelength ($\lambda = 4.2 \mu\text{m}$). The CO₂ molecules inside the measurement chamber absorb the filtered light, causing the molecules to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low frequency operation, and the microcontroller converts the output into a CO₂ concentration reading. In order to provide accurate CO₂ sensing information, the absorption chamber is acoustically isolated from external noise.

Block diagram

The XENSIV™ PAS CO₂ 5V sensor module PCB integrates a PAS transducer, a microcontroller, and a MOSFET. The PAS transducer includes a proprietary infrared emitter with blackbody radiation which is periodically chopped by the MOSFET, a narrow-band optical filter tuned to the CO₂ wavelength and Infineon's MEMS microphone, which acts as a pressure sensor and is optimized for low frequency operation.

Pin configuration

PIN	Symbol	Type	Description
1	VDD3.3	Power supply (3.3 V)	3.3 V digital power supply
2	Rx	Input/Output	UART receiver pin (3.3 V domain)
3	SCL	Input/Output	I ² C clock pin (3.3 V domain)
4	Tx/SDA	Output	UART transmitter pin (3.3 V domain)/ I ² C data pin (3.3 V domain)
5	PWM_DIS	Input	PWM disable input pin (3.3 V domain)
6	GND	Ground	Ground
7	INT	Output	Interrupt output pin (3.3 V domain)
8	PSEL	Input	Communication interface select input pin (3.3 V domain)
9	PWM	Output	PWM output pin (3.3 V domain)
10	VDD5	Power supply (5 V)	5 V power supply for the IR emitter



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