



Digital nose for air quality: Bosch Sensortec's 4-in-1 gas sensor with AI

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Best performance in an extensive range of gas sensing applications enabled by artificial intelligence (AI)

- ▶ First digital gas sensor with AI, ideal for development of new applications
- ▶ Straightforward customization for specific use cases, such as detection of spoiled food, bad breath and forest fires
- ▶ 4-in-1 MEMS sensor measures gases, humidity, temperature and barometric pressure in a single compact package to reduce total cost of ownership (TCO)
- ▶ Market-leading sensor performance based on the proven BME680 platform, enhanced by new AI capabilities

Whether at home, in the office or outdoors, we need to be confident that the air around us is clean and safe to breathe – COVID-19 has clearly highlighted the importance of air quality. Due to the particulates, gases and even airborne viruses ubiquitously present in our modern environment, poor air quality has an increasingly negative impact on our health and well-being.

To address this growing need, Bosch Sensortec has announced the BME688, the first air quality MEMS sensor that combines gas, humidity, temperature and barometric pressure sensing with innovative artificial intelligence (AI) capability; essentially creating the world's smallest four-in-one air quality measurement solution. This single device enables customers to reduce their total cost of ownership, cut their development time and simplify design.

The new BME688 is ideal for the latest, customized applications, such as food spoilage detection and timely forest fire detection by detecting the gases present, and tracking temperature and humidity changes. The sensor's AI features and Bosch Sensortec's new BME AI-Studio software tool make it straightforward for customers to rapidly develop custom solutions for their specific use cases. To further cut time to market, Bosch Sensortec also provides an Adafruit-compatible development kit.

Built on Bosch Sensortec's proven BME680 platform, the BME688 features an updated gas sensor enabling an extended measurement range and sophisticated AI features. The gas sensor now detects the presence of many gases, including volatile organic compounds (VOCs), volatile sulfur compounds (VSCs) and other gas types such as carbon monoxide and hydrogen, in the parts per billion (ppb) range.

"The BME688 combines reliable high-precision sensors with wide-ranging gas detection and innovative AI capabilities in a single package," says Dr. Stefan Finkbeiner, CEO at Bosch Sensortec. "This enables our customers to rapidly develop the next generation of applications designed to improve well-being, lifestyle and sustainability."

For example, a customer may want to develop a sensor-based product that can detect spoiled food, which would be indicated by the VSCs produced by bacteria in the food. Similarly, bad breath or body odor could be detected based on the VSCs they produce.

The optimal approach is to collect indicative real-life data directly in the field. For instance by sampling gases in the vicinity of both fresh and decaying food, to thereby create different combination models for the VSCs present in the given air sample. The BME688 is capable, by default, of very accurate detection of VSCs, and the BME AI-Studio enables it to be optimized for other gas mixtures and applications.

By sampling gases in the field instead of the lab, the derived algorithms that are utilized by the new detection devices are far more reliable in evaluating actual conditions. Together with gas data, the BME688 simultaneously measures humidity, barometric pressure and temperature as supplementary data inputs for complete AI modeling.

In our example application, the customer categorizes this mass of data and then applies it in the development of their AI model in the BME AI-Studio, essentially training the BME688 to recognize the tell-tale signs of bacterial growth on the food. Once the sensor is trained, the final AI code runs on a system microcontroller in the customer's end product. This AI code is generally lightweight and will run quite easily on the existing microcontroller that handles system control and management tasks.

The BME688 has been developed for mobile and connected applications where size and low power consumption play a critical role. The sensor is housed in a compact package, measuring just 3.0 x 3.0 x 0.9 mm³. Current consumption can

be configured between 2.1 µA and 11 mA depending on the required data rates and functions, and can be optimized using the BME AI-Studio.

Availability:

The BME688 is available now.

Website:

<https://www.bosch-sensortec.com/products/environmental-sensors/gas-sensors/bme688/>

Video:

<https://www.youtube.com/watch?v=xcZKKNrBt2g>

Press photos:

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Contact:

Constantin Schmauder
phone: +49 7121 35-31058
Twitter: @BoschMEMS

Contact person for press inquiries:

Christian Hoenicke
phone: +49 7121 35-35924

BOSCH SENSORTEC AT EMBEDDED WORLD DIGITAL:

VIRTUAL BOOTH: March 01 – March 05, 2021 <https://www.bosch-sensortec.com/about-us/events/embedded-world-2021-digital/>

DEEP-DIVE SESSIONS WITH BOSCH-EXPERTS:

- **March 1, 2021:** 04:50-05:20 pm CET - Presentation and Q&A session
'Bosch unveils the new robust barometric pressure sensor BMP384 & the first gas sensor with Artificial Intelligence BME688'
- **March 4, 2021:** 11:30-12:00 am CET - Presentation and Q&A session
'AI-catching": Environmental sensing and fitness tracking with Artificial Intelligence'

Bosch Sensortec GmbH, a fully owned subsidiary of Robert Bosch GmbH, develops and markets a wide portfolio of microelectromechanical systems (MEMS) sensors and solutions tailored for smartphones, tablets, wearables and hearables, AR/VR devices, drones, robots, smart home and IoT (Internet of Things) applications. The product portfolio includes 3-axis accelerometers, gyroscopes and magnetometers, integrated 6- and 9-axis sensors, smart sensors, barometric pressure sensors, humidity sensors, gas sensors, optical microsystems and comprehensive software. Since its foundation in 2005, Bosch Sensortec has emerged as the MEMS technology leader in the markets it addresses. Bosch has been both a pioneer and a global market leader in the MEMS sensor segment since 1995 and has, to date, sold more than 10 billion MEMS sensors.

For more information, please visit www.bosch-sensortec.com, twitter.com/boschMEMS, community.bosch-sensortec.com, linkedin.com/company/bosch-sensortec/, youtube.com/user/BoschSensortec

The Bosch Group is a leading global supplier of technology and services. It employs roughly 400,000 associates worldwide (as of December 31, 2019). The company generated sales of 77.7 billion euros in 2019. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies in 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. Bosch employs some 72,600 associates in research and development at 126 locations across the globe, as well as roughly 30,000 software engineers.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The remaining shares are held by the Bosch family, by a corporation owned by the family, and by Robert Bosch GmbH. The majority of voting rights are held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust.

Additional information is available online at www.bosch.com, www.iot.bosch.com, www.bosch-press.com, <https://twitter.com/BoschPress>