

Like a sniffer dog:

A gas sensor for air quality

BME690 – 4-in-1 environmental sensor with AI

A dog's nose has up to 220 million olfactory cells. Sniffer dogs have an incredible nose and can even sniff out forbidden substances. Inspired by the animal's super-sensitive organ, the BME690 detects spoiled food or bad breath, for example. The BME690 is further developed on BME688, with increased robustness for use in environments with high condensation levels. It can measure gas, humidity, temperature and air pressure simultaneously and is the world's smallest 4-in-1 air quality sensor (3.0 x 3.0 x 0.93 mm³).



Target applications



Wearables



Mobile & care
devices



Smart
home
devices



**Indoor air quality
detection**

Benefits



Standardizability

Alignment to WELL/RESET standards for indoor air quality



Robustness

Usage in high condensation use cases



Power-efficient

Reduced power consumption - optimal for battery operated devices



Breath analysis



**Food freshness
detection**

Technical features

BME690 technical data	
Package dimensions (typ.)	3.0 x 3.0 x 0.93 mm³ 8-Pin LGA with metal
Operating range	Pressure: 300...1100 hPa Humidity 0...100% Temperature: -40...85°C
Supply voltage VDDIO	1.2 ... 3.6 V
Supply voltage VDD	1.71 ... 3.6 V
Interface	I²C (up to 3.4 MHz) and SPI (3 and 4 wire, up to 10 MHz)
Average typical current consumption	2.2 µA at 1 Hz for h/T 3.1 µA at 1 Hz for p/T 4.2 µA at 1 Hz for h/p/T 50 µA at ULP mode for p/h/T/air quality 0.5 mA at LP mode for p/h/T/air quality 3.1 mA in standard gas scan mode
Gas sensor	
Sensor-to-sensor deviation (IAQ)	± 15% ± 15 IAQ
IAQ Operating modes	3 sec (LP) and 300 sec (ULP)
Major sensor outputs	Index for Air Quality (IAQ), bVOC- & CO2-equivalents (ppm)
Humidity sensor	
Response time	1 s (τ0-63%)
Accuracy tolerance	± 3 % relative humidity
Hysteresis	± 1 % relative humidity
Pressure sensor	
Relative Accuracy	±0.05 hPa
Absolute Accuracy	± 0.5 hPa
Temperature coefficient offset	±1.3 Pa/K (equiv. to ±10.9 cm at 1°C temperature change)
Temperature sensor	
Absolute accuracy	±0.5 °C (0-65°C)

Pin configuration

TOP VIEW
(pads not visible)

Vent hole

8 V_{DD}

1 GND

7 GND

2 CSB

6 V_{DDIO}

3 SDI

5 SDO

4 SCK

BOTTOM VIEW
(pads visible)

Pin 1 marker

1 GND

2 CSB

3 SDI

4 SCK

5 SDO

6 V_{DDIO}

7 GND

8 V_{DD}

Pin	Name	Description
1	GND	Ground
2	CSB	Chip select
3	SDI	Serial data input
4	SCK	Serial clock input
5	SDO	Serial data output
6	VDDIO	Digital interface supply
7	GND	Ground
8	V_{DD}	Analog supply



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Headquarters
Bosch Sensortec GmbH

Gerhard-Kindler-Strasse 9
72770 Reutlingen · Germany
Telephone +49 7121 3535 900

www.bosch-sensortec.com