BME688



BME688 Environmental Sensor 4-in-1

v1.0 2025-07-17

Rev. A

Professional electronic component

PRODUCT OVERVIEW

The BME688 Environmental Sensor 4-in-1 is a versatile sensor module that combines temperature, humidity, pressure, and gas sensing capabilities in a single compact package. It utilizes the BME688 sensor from Bosch, which is known for its high accuracy and low power consumption. This module is ideal for applications in environmental monitoring, IoT devices, and smart home systems. | Resource | Link | |:------| | Wiki-UNIT Electronics | Wiki - UNIT Electronics | Github Repository | Product Brief | Product brief | Schematic | Schematic |

PRODUCT VIEWS

TOP VIEW BOTTOM VIEW

Top View

Bottom View

Component placement and connectors

Underside components and connections

TECHNICAL FEATURES

Axes: 3 (X, Y, Z) Measurement Range: ±1300 µT

Resolution: \sim 0.3 μT Power Consumption: Ultra-low power consumption for battery-

operated devices

Interfaces: I²C and SPI Supply Voltage: 3.3 V

Operating Temperature: Wide operating range suitable for various environments

TECHNICAL SPECIFICATIONS



FEATURE	DESCRIPTION
Sensor	BME688 Environmental Sensor
Communication Protocol	I2C and SPI
Power Supply	1.71V to 3.6V

Technical Datasheet - BME688



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PARAMETER	TECHNICAL DATA		
Package dimensions	8-Pin LGA with metal3.0 x 3.0 x 0.93 mm ³		
Operation range (full accuracy)	Pressure: 3001100 hPaHumidity: 0100%Temperature: -4085°C		
Supply voltage VDDIO	1.2 3.6 V		
Supply voltage VDD	1.71 3.6 V		
Interface	I ² C and SPI		
Average current consumption	$2.1~\mu A$ at $1~Hz$ humidity and temperature $3.1~\mu A$ at $1~Hz$ pressure and temperature $3.7~\mu A$ at $1~Hz$ humidity, pressure and temperature $90~\mu A$ at ULP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at LP mode for p/h/T & air quality $90.9~\mu A$ at 90		
Gas sensor - F1 score for H ₂ S scanning	0.94		
Gas sensor - Standard scan speed	10.8 s / scan		
Gas sensor - Electric charge for standard scan	0.18 mAh (5 scans ~ 1 min)		
Gas sensor - Response time (τ 33-63%)	< 1 s (for new sensors)		
Gas sensor - Sensor-to- sensor deviation	+/- 15%		
Gas sensor - Power consumption	< 0.1 mA in ultra-low power mode		
Gas sensor - Output data processing	Major direct outputs: Index for Air Quality (IAQ), bVOC-& CO2-equivalents (ppm), Gas scan result (%) & many more (all listed in datasheet in Table 20: BSEC outputs)		
Humidity sensor - Response time (τ0- 63%)	8 s		
Humidity sensor - Accuracy tolerance	± 3 % relative humidity		
Humidity sensor - Hysteresis	≤ 1.5 % relative humidity		
Pressure sensor - RMS Noise	0.12 Pa (equiv. to 1.7 cm)		
Pressure sensor - Sensitivity Error	± 0.25 % (equiv. to 1 m at 400 m height change)		
Pressure sensor - Temperature coefficient offset	±1.3 Pa/K (equiv. to ±10.9 cm at 1°C temperature change)		

SUPPORTS

SYMBOL	I/O	DESCRIPTION	
VCC	Input	3.3V or 5V	
GND	GND	Common ground for all components	

HARDWARE DOCUMENTATION

MECHANICAL DIMENSIONS



Physical dimensions and mounting specifications (measurements in millimeters)

SYSTEM TOPOLOGY



Connection topology and system integration diagram

Click image to open in full size

		CE		COMPONENT REFERENCE					
F	EATURE	ICON		DESCRIPTION					
Relative Humidity		Accurately measures ambient moisture for precise environmental monitoring.							
Barometric Pressure		Detects atmospheric pressure changes to support dynamic weather tracking.							
Excellent Temperature Stability		Delivers consistent temperature readings even under varying conditions.							
Gas Sensin	ng		Monitors a range of gases to help identify potential environmental hazards.						
REF.		DESCRIPTION							
IC1	BME688 Envir	BME688 Environmental Sensor							
L1	Power On LED	Power On LED							
U1	AP2112K 3V3	AP2112K 3V3 Regulator							
JP1	2.54 mm Cast	2.54 mm Castellated Holes							
J1	QWIIC Conne	QWIIC Connector (JST 1 mm pitch) for I2C							
INTERF	ACE	SI	GNALS / PINS	TYPICAL USE					
UART	_			Unavailable					
I ² C	SDA, SCL	(CSB held	d high)	Default interface (Qwiic connector)					
SPI	CSB = GNI	D, SDI (M	OSI), SCK, SDO (MISO)	High-speed alternative					
USB	_			Unavailable on this module					

CIRCUIT SCHEMATIC



Complete circuit schematic showing all component connections

View Complete Schematic PDF

PIN DESCRIPTION

Detailed pin assignment and electrical specifications

SIGNAL DESCRIPTION FUNCTION NOTES Power Supply 3.3V or 5V Ground Common ground for all components **GROUP SUGGESTED USE AVAILABLE PINS** SPI CSB, SDI (MOSI), SDO (MISO), SCK High-speed SPI to read sensor data I²C SDA, SCL (via Qwiic connector) Standard I²C for configuration & data acquisition

PIN CONFIGURATION LAYOUT

Physical connector layout and pin positioning



Pin Configuration Layout

Complete pin configuration diagram showing all connectors, pin assignments, and electrical connections for proper integration

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