EC Sense
Easy Gas Sensors

Smart Double Gas Sensor Module
DGM10 Series
Datasheet

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Overview

The DGM10 Gas Sensor Module is an Intelligent digital dual gas sensor module, using a smart microprocessor with high-reliability solid polymer electrochemical gas sensing technology and intelligent algorithm calculation, with temperature and humidity combined in one sensor module.

The DGM10 Gas Sensor Module is for indoor and outdoor environments. It detects gas, temperature and humidity and easily receives all of the data simultaneously. The changing state of gas is closely related to temperature and humidity, for which this combination of EC Sense's DGM10 Gas Sensor Module provides a professional solution.

The intelligent Gas Sensor Module provides a selftest which evaluates the sensor performance without a gas measurement. Therefore, it is the excellent solution for smart home and IoT applications. The data is put out through the transmission command, which makes it easy and convenient for knowing the right time to perform maintenance and replacement.

Each DGM10 Sensor Module has been professionally calibrated with the gas. It can be instantly used without any warm-up time and the calibration information is stored in the flash chip. There is a data revision command for secondary development or if a recalibration is to be performed. DGM10 Sensor Module has I^2C, UART (Modbus-RTU) and SPI output interface, which can be easily integrated into different devices and systems.

Key Features

☞ Intelligent algorithm calculation

☞ Detects two gases + temperature + humidity

☞ Suitable for indoor and outdoor environments, the sensor can work in -40 ℃ to 55 ℃

☞ With I^2C, UART (Modbus-RTUl), SPI output interface

☞ With calibration

☞ With sensor performance and life-testing output

☞ Response time is fast and has a stable zero point without drift

☞ Low power consumption and sleeping mode, suitable for low battery IoT applications

☞ Provides sensor data calibration interface, which is convenient for users to perform their own development or sensor re-calibration.

☞ Long lifetime gas sensor, anti-poisoning

☞ EMC approved, electronic circuit board has dust and corrosion-proof coating protection

☞ RoHS approved

☞ Small size 26 x 26 mm
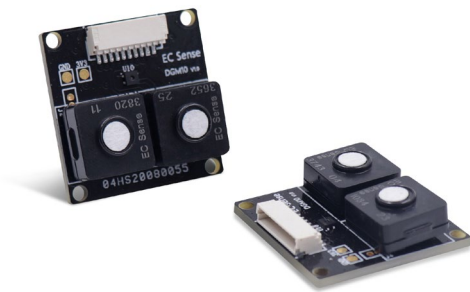
Applications

☞ Industrial Safety Gas Detection

☞ Indoor Air Quality Monitoring

☞ Outdoor Environmental Pollution Monitoring

☞ Air Exchange System and Air Purifier

☞ Food Industry

☞ Medical & Health Care

☞ Professional Gas Detection Instrument

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›› Principle

The DGM10 Sensor Module is a durable product. It converts the original small current signals of the two gas sensors into standard I^2C, UART and SPI outputs through a digital circuit. It has an independent digital temperature and humidity sensor.

The DGM10 Sensor Module uses the Solid Polymer Electrochemical Sensing Technology. It employs a three-electrode arrangement- the working, the counter and the reference electrodes- in which concentration measurements can be performed continuously and the sensor operates at a fixed potential. The gas of interest (target gas) diffuses through a diffusion barrier, such as a capillary, into the cell to the working electrode, where an electrochemical reaction takes place. Oxidation and reduction reactions are happening simultaniously. The current flowing through the cell is direct proportional to the concentration of the target gas. A reference electrode keeps, with a potentiostat, the potential constant together.
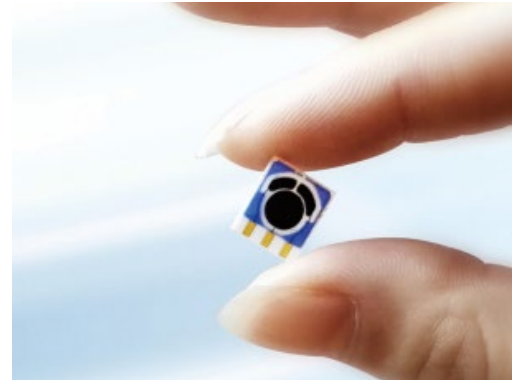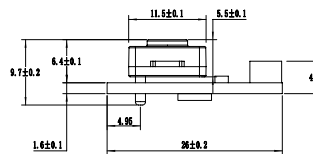
›› Mechanical Drawing

DGM10 Mechanical Drawing (unit: mm)
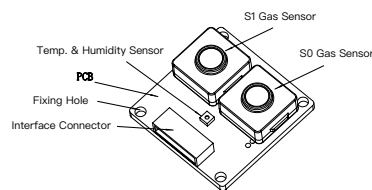
Product Schematic
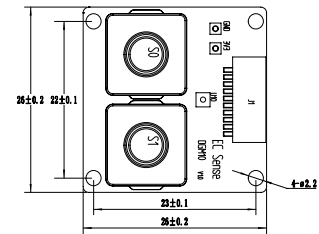
Side View

Top view

10Pin Cable Mechanical Drawing
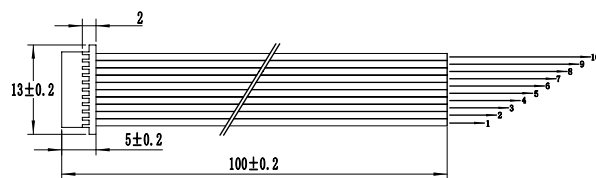
Product Schematic
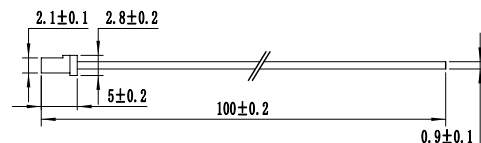
Side View

1	VCC	Purple	Supply voltage (3.3 V - 5.5 V)
2	GND	Grey	Ground
3	UART_TX	Brown	Receiving data (3.3 V)
4	UART_RX	Orange	Transmitting for communication (3.3 V)
5	I^2C_SDA	White	Serial data input/output (3.3 V)
6	I^2C_SCL	Blue	Serial clock input (3.3 V)
7	SPI_MOSI	Green	SPI master output slave input (3.3 V)
8	SPI_CLK	Yellow	SPI clock (3.3 V)
9	SPI_MISO	Black	SPI master input and slave output (3.3 V)
10	SPI_CS	Red	SPI slave select (3.3 V)

⟫ Technology Specifications

Gas Sensor Specifications

Detection Gases	Please choose from "Order information"
Ranges	Please choose from "Order information"
Resolutions	Please see the "Order Information"
Response Times	Please see the "Order Information"
Principle	Solid Polymer Electrochemical Sensing Technology
Accuracy	± 5% F.S
Repeatability	< 1.5 % (typically)
Linearity	Linear
Long-Term Drift	< 5 %/year
Expected Lifetime	> 3 years

Temperature & Relative Humidity Sensor Specification

Parameter	Range	Resolution	Accuracy	Repeatability	Response Time	Long-Term Drift
Temperature	-40 ℃ to +85 ℃	0.01 ℃	± 0.2 ℃	0.1 ℃	< 5 s to 30 s @ t63 %	< 0.02 °C/year
Humidity	0-100% RH	0.01% RH	± 2% RH	0.1% RH	8 s @ t63 %	< 0.25% RH/year

Electrical Specifications

Output Signal	UART (Modbus-RTU), I^{2}C, SPI (by request), for more information please see "Communication Protocol"
	UART baud rate: 115200 baud Data bit: 8 bits Stop bit: 1 bit；Modbus-RTU Protocol
	I^{2}C frequency: ≤ 100 kHz
	SPI (by request)
Cable	10Pin, 100 mm length
Deep Sleep Mode	To reduce power consumption, the DGM10 Sensor Module can be set to sleep mode by a special command. Even during the sleep state, the sensor remains in operation in order to respond immediately to the gas when it is awake, while maintaining the lowest power consumption. Therefore, it is very suitable for IoT battery power supply or other applications with low power consumption requirements.
Sensor Lifeself Testing	Please see the Conmunication Protocol and Manual

Supply Voltage	LED Status	Average Current	Sleep Current
3.3 V	LED-ON	9.1 mA	0.36 mA
	LED-OFF	8.6 mA	
5 V	LED-ON	9.6 mA	0.47 mA
	LED-OFF	8.9 mA	

Note: The current data above will have slight differences due to the different stabilization times of different sensors at the first power-on. Please refer to the actual measurement data.

Enviroment Specifications

Operating Temperature	Sensor can work from -40 ℃ to +55 ℃
Operating Humidity	15-95% RH. Non-condensing
Operating Pressure	Atmospheric pressure ± 10 %
Storage Temperature	0 ℃ to 20 ℃

Technology Specifications

Mechanical Specifications

Size (Including Gas Sensor)	26 x 26 x 9.7 mm
Size (Without Gas Sensor)	26 x 26 x 4.8 mm
Weight (Including Gas Sensor)	4.3 g
Weight (Without Gas Sensor)	2.92 g
10Pin Cable Weight	1.8 g
Warranty	12 months from the date of shipment
Package	ESDBAG Size: 120 x 150 mm

Order Information

04-DGM10- | A | – | B | – | C | – | D | –01

S0	S1	Range0	Range1
O_2	CO	25%	1000
NH_3	H_2S	10	5
PH_3	O_2	20	25%
SO_2	NO_2	5	5
TVOC	HCHO	10	5
......	......	......	......

S0: Gas1   Range0: The range of Gas1
S1: Gas2   Range1: The range of Gas2

Example Part Number1
04-DGM10-O_2-CO-25%-1000-01
04-DGM10: Double Gas Sensor Module
O_2: Detect Oxygen(O_2)
CO: Detect Carbon Monoxide(CO)
25%: Measurement range is 0-25% vol.
1000: Measurement range is 0-1000 ppm

Gas List

Item	Gas	Gas Formula	Range	Resolution	Response Time
1	Arsenide	AsH_3	0-1 ppm	< 0.02 ppm	< 3 s (T90 < 30 s)
2	Diborane	B_2H_6	0-5 ppm	0.01 ppm	< 3 s (T90 < 80 s)
3	Methyl Mercaptan	CH_4S	0-10 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 30 s)
4	Chlorine	Cl_2	0-5 ppm	< 0.01 ppm	< 3 s (T90 < 60 s)
			0-50 ppm	< 0.1 ppm	< 3 s (T90 < 60 s)
5	Chlorine Dioxide	ClO_2	0-1 ppm	0.01 ppm	< 3 s (T90 < 60 s)
			0-5 ppm	0.01 ppm	< 3 s (T90 < 60 s)
			0-50 ppm	0.1 ppm	< 3 s (T90 < 60 s)
6	Carbon Monoxide	CO	0-10 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-10000 ppm	1 ppm	< 3 s (T90 < 30 s)
7	Ethylene	C_2H_4	0-10 ppm	0.01 ppm	< 3 s (T90 < 80 s)
			0-200 ppm	0.1 ppm	< 3 s (T90 < 80 s)

Gas List

Item	Gas	Gas Formula	Range	Resolution	Response Time
8	Ethylene Oxide	ETO	0-10 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
9	Formaldehyde	HCHO	0-5 ppm	0.01 ppm	< 3 s (T90 < 120 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 120 s)
10	Hydrogen Cyanide	HCN	0-5 ppm	0.01 ppm	< 3 s (T90 < 120 s)
			0-50 ppm	0.1 ppm	< 3 s (T90 < 120 s)
11	Hydrogen	H_2	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-5000 ppm	1 ppm	< 3 s (T90 < 30 s)
			0-5% vol.	0.001% vol.	< 3 s (T90 < 90 s)
12	Hydrogen Sulfide	H_2S	0-2 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-10 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-50 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-500 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-5000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
13	Indoor Air Quality	IAQ	0-10 ppm	0.01 ppm	< 3 s (T90 < 15 s)
			0-200 ppm	0.1 ppm	< 3 s (T90 < 15 s)
14	Ammonia	NH_3	0-10 ppm	0.01 ppm	< 3 s (T90 < 150 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 150 s)
15	Nitrogen Dioxide	NO_2	0-5 ppm	< 0.005 ppm	< 3 s (T90 < 60 s)
			0-50 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
			0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
16	Oxygen	O_2	0-25% vol.	0.01% vol.	< 3 s (T90 < 10 s)
17	Ozone	O_3	0-5 ppm	< 0.01 ppm	< 3 s (T90 < 120 s)
			0-100 ppm	< 0.01 ppm	< 3 s (T90 < 120 s)
18	Phosphine	PH_3	0-20 ppm	0.01 ppm	< 3 s (T90 < 30 s)
			0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
19	Sulfur Dioxide	SO_2	0-5 ppm	< 0.01 ppm	< 3 s (T90 < 60 s)
			0-50 ppm	0.1 ppm	< 3 s (T90 < 60 s)
			0-100 ppm	0.1 ppm	< 3 s (T90 < 60 s)
			0-1000 ppm	0.1 ppm	< 3 s (T90 < 60 s)
			0-2000 ppm	0.1 ppm	< 3 s (T90 < 60 s)

⏩ Gas List

Item	Gas	Gas Formula	Range	Resolution	Response Time
20	Odor Gas	SMELL	0-5 ppm	0.01 ppm	< 3 s (T90 < 80 s)
			0-500 ppm	0.1 ppm	< 3 s (T90 < 80 s)
21	Volatile Organic Compounds	TVOC	0-10 ppm	0.01 ppm	< 3 s (T90 < 80 s)
			0-500 ppm	0.1 ppm	< 3 s (T90 < 80 s)
			0-2000 ppm	0.1 ppm	< 3 s (T90 < 80 s)

Note: 1) If there is a gas or range not to be found in the above list please contact us.

2) After taking a sensor out of the circuit board please follow the above "sensor position" to reinstall the sensor on the board. The wrong position will result in incorrect measurment results.

Product Name	Partnumber
10Pin Cable	02-CABLE-SH1.0-10P10-01

Note: A cable of more than 10cm in length can be added by request.

Disclaimer

The EC Sense performance data stated above is based on data obtained under test conditions using the EC Sense gas distribution system and AQS test software. In the interest of continuous product improvement, EC Sense reserves the right to change design features and specifications without notice. We are not responsible for any loss, injury or damage caused by this. EC Sense assumes no responsibility for any indirect loss, injury or damage resulting from the use of this document, the information contained therein or any omissions or errors herein. This document does not constitute an offer to sell. The data it contains are for informational purposes only and cannot be considered a guarantee. Any use of the given data must be evaluated and determined by the user to comply with federal, state and local laws and regulations. All specifications outlined are subject to change without notice.

⚠ Warning

EC Sense sensors are designed for use in a variety of environmental conditions. However, due to the principles and characteristics of solid polymer electrochemical sensors and to ensure normal use, users must strictly follow this article during storage, assembly and operation of the module. General-purpose PCB circuit board application methods and illegal applications or violation of the application will not be covered by the warranty. Although our products are highly reliable, we recommend checking the module's response to the target gas prior to utilization to ensure on-site use. At the end of the products service life, please do not discard any electronics in the domestic waste, instead follow the local governments electronic waste recycling regulations for disposal.

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