posifa TECHNOLOGIES

PGS5100

MEMS THERMAL CONDUCTIVITY HYDROGEN SENSOR

131 E. Brokaw Road | San Jose CA 95112 | +1 (408) 392-0989 | info@posifatech.com | www.posifatech.com

DESCRIPTION

The PGS5100 series of hydrogen sensors detects hydrogen concentration in the air by measuring the change in thermal conductivity of the gas mixture. Hydrogen and air have very different thermal conductivity. Variations in hydrogen concentration result in significant changes in the thermal conductivity of the gas mixture.

The PGS5100 series incorporates a relative humidity sensor and barometric pressure sensor to compensate for thermal conductivity changes caused by the presence of humidity in air and elevation. Humidity and pressure compensation make the PGS5100 more accurate in hydrogen concentration measurement, allowing it to comply with industry standards for flammable gas detection.

The PGS5100 series uses Posifa's second-generation thermal conductivity die, packaged in an SMD form factor. Posifa's thermal conductivity sensor has been tested with long-term exposure to harsh environments, including hundreds of thermal cycles and freezing. It has shown excellent stability and robustness.

The PGS5100 series supports MODBUS/RS485 output. In the future it will support CAN bus. The PGS5100 is housed in an IP6K9-compliant enclosure with a wire harness that is terminated with an automotive-grade connector for enhanced durability.

FEATURES

- Humidity and pressure compensated
- Remains accurate in harsh environments
- Non-reactive to "poisons" or contaminants
- Long-term stability (>15-year operating life)

APPLICATIONS

- Hydrogen leak detection
- Battery thermal runaway early detection
- Process monitoring

ABSOLUTE MAXIMUM RATINGS

- Operating temperature: -40 °C to 85 °C
- Storage temperature: -40 °C to 90 °C
- Supply voltage: 5 Vdc

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GENERAL SPECIFICATION

ELECTRICAL					
SPECIFICATIONS	**MIN**	**TYP**	**MAX**	**UNIT**	**CONDITIONS**
Supply Voltage	4.75	5	5.5	Vdc	
Power - Peak			190	mW	5 Vdc and TC sensors are turned on
Power - Average			50	mW	

ENVIRONMENTAL					
SPECIFICATIONS	**MIN**	**TYP**	**MAX**	**UNIT**	**CONDITIONS**
Operating Temperature	-40		85	° C	
Storage Temperature	-40		90	° C	
Operating Relative Humidity	0		100	% RH	Resistant to condensation
Operating Pressure	70		120	kPa	

HYDROGEN DETECTION, Vdd = 5 Vdc					
SPECIFICATIONS	**MIN**	**TYP**	**MAX**	**UNIT**	**CONDITIONS**
Detection Gas	Hydrogen in air				Diffusion
Principle of Detection	Thermal conductivity				
Measurement Range	0 to 25			Vol %	H2 volume percentage (equivalent)
H2 Concentration Change Rate	10			ppm/s	
Resolution - Digital		2		ppm	
Accuracy [1]			1200	ppm	Initial, overall environmental conditions
			6	% reading	Above 20000 ppm H2 in air at 25 °C
Response Time t(90) [2]			100	ms	

1. Errors include effects of pressure variation from 70 Kpa to 120 KPa, and relative humidity variation from 0 % RH to 100 % RH
2. Customization for faster response time and warm-up time is available

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OUTPUT DESCRIPTION

Digital Output (Count)

Hydrogen concentration in ppm = count

For example, when the output count = 5000, the hydrogen concentration is 5000 ppm (or 0.5 % vol).

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COMMUNICATION PROTOCOL

1. MODBUS-RTU Frame Format

0x03 Read multiple registers

1.1 Sent by the main station:

Byte	1	2	3	4	5	6	7	8
Content	addr	0x03	RegAddr_H	RegAddr_L	RegNum_H	RegNum_L	CRC_L	CRC_H

Byte 1: addr Slave address: default 0x01
Byte 2: 0x03 Read the register function code
Byte 3. 4: The starting address of the register to be read
Byte 5. 6: The number of registers to be read
Byte 7. 8: The CRC16 checksum from bytes 1 to 6

1.2 Sent from the station:

Byte	1	2	3	4	5	6 7	...	2*M+2 2*M+3	2*M+4	2*M+5
Content	addr	0x03	Total bytes M * 2	RegData1_H	RegData1_L	RegData2	...	RegDataM	CRC_L	CRC_H

Byte 1: addr Slave address: default 0x01
Byte 2: 0x03 Return to read the function code
Byte 3: M*2 The total number of bytes from 1 to M in the register data
Byte 4~ 2*M+3: Register data
Byte 2M+4. 2M+5: The CRC16 checksum from bytes 1 to 2*M+3
Example: Read the value of register 0x030C (read sensor temperature)
TX: 01 03 03 0C 00 01 44 4D
RX: 01 03 02 01 20 B8 0C
Data 0x0120 is equal to 288 in decimal, T = 288 * 0.1 = 28.8 °C (for specific details, please refer to the register description)

2. Register Definition

Modbus Address		Explanation of meaning	R/W	Data type
Hex	Dec			
0x0300	768	Original temperature dataT_Raw	R	Unsigned
0x0301	769	Sensor raw dataS_Raw	R	Unsigned
0x0302	770	Sensor data after temperature compensationS_Raw_TempComp	R	Unsigned
0x0303	771	The original concentration is low bytes Raw_PPM	R	Signed
0x0304	772	The original concentration is high bytes Raw_PPM		
0x0305	773	Air pressure compensation quantity; （Unit 1 ppm）	R	Signed
0x0306	774	Humidity compensation quantity; （unit 10 ppm）	R	Signed
0x0307	775	Final_PPM; （lower 16 bits）	R	Signed
0x0308	776	Final_PPM; （lower 16 bits）		
0x0309	777	Gas LFL concentration; （unit 0.1 % LFL）	R	Unsigned
0x030A	778	System status flag	R	*
0x030B	779	ROR	R	Signed
0x030C	780	Temperature; （Unit 0.1 ° C）	R	Signed
0x030D	781	Humidity; （unit 0.1 ° C）	R	Signed
0x030E	782	Air pressure; （unit 10 Pa）	R	Signed

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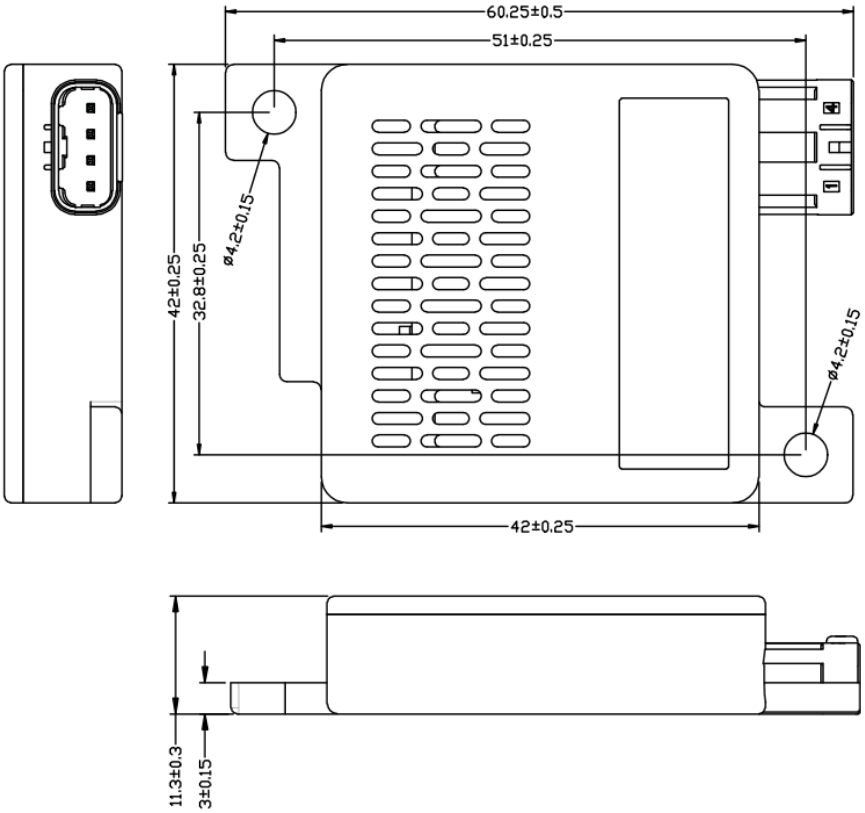
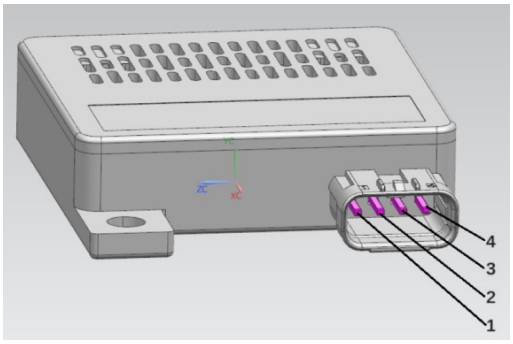
CONNECTION INTERFACE





PIN	Description
1	+5 Vdc
2	RXD
3	TXD
4	GND

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INSTALLATION

The PGS5100 must be exposed to measured air at all times. The location must be chosen so as to maximize air exchange; dead spaces must be avoided. Preferably, the vent in the module should be facing downward. If this is not possible, it should be vertical, but should never be facing upward, to prevent accumulation of dirt and water.

ORDERING INFORMATION

PART NUMBER	SPECIFICATIONS
PGS5100	0 % to 25 %vol, RS485 connector terminated