

SPECIFICATION

Product Name: Automotive Air Quality Sensor Module

Item No.: AQM-1000

Version: V0.2

Date: 2021-03-12

Writer	Audit	Approved
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Revision

No.	Version	Content	Reviser	Date
1	V0.1	Initial revision	Karen Lin	2019-6-12
2	V0.2	Update detection gas type (SO2/NH3) , IP5K4 upgrade to IP6K7	He Tao	2021-3-12

Air Quality Module

AQM-1000



Applications

- ◇ Automotive
- ◇ Air purifiers
- ◇ Air conditioners
- ◇ HVAC Equipment
- ◇ IAQ/OAQ monitors

Description

The automotive-grade gas sensor based on the MOX principle and MEMS manufacturing process detects the redox gas in the environment to determine the air quality level of the air-conditioning inlet, and automatically controls the air-conditioning inlet valve to maintain the fresh air in the car through the ECU.

Features

- Self-developed nano-gas sensitive slurry with controllable technology
- Can detect CO, HC, NO_x, NH₃, SO₂ and other gases
- More gas options, smaller size
- High sensitivity, fast response and recovery speed
- High selectivity between diesel and gasoline

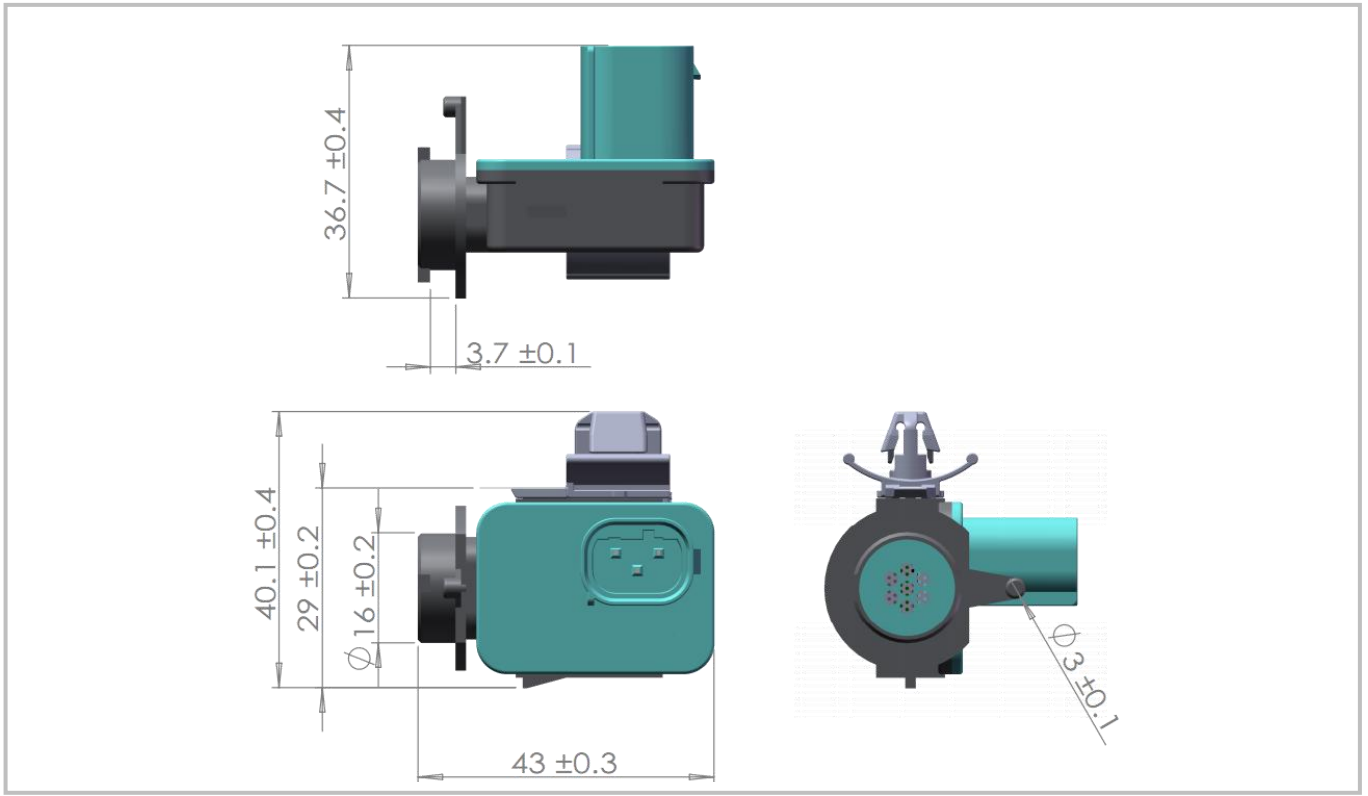
Working Principle

AQM-1000 use the oxidation and reduction of gas on the surface of the semiconductor to cause changes in the resistance of sensitive components, a gas having a tendency to adsorb negative ions such as oxygen is called an oxidizing gas - an electron-accepting gas, a gas having a tendency to adsorb positive ions such as hydrogen, a carbon oxide compound or an alcohol is called a reducing gas-electron supply type gas.

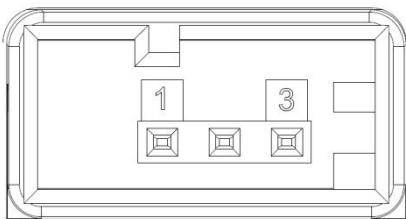
When an oxidized (reduced) type gas is adsorbed onto an N(P) type semiconductor, carriers of the semiconductor are reduced (increased), and resistivity is increased (decreased); when adsorbed onto a P(N) type semiconductor, carriers of the semiconductor are increased. (decreased), the resistivity drops (rises). It can be seen that the oxidized and reduced semiconductors are diametrically opposed, so that the corresponding gases can be effectively detected from these properties.

Dimensions and Connector

1. Dimensions (Unit mm, 43*29*36.7mm)



2. Connector Pinout



No.	Pin	Description
1	Supply	Supply Voltage
2	GND	Ground
3	LIN	Output Signal (LIN/PWM)

3. Connector

Item	Part Number	Pitch	Recommendation
Sensor Connector(Integrated with shell injection)	967167-6	1.8mm	TE
Mating Connector	TE 967642-1 Coding B	1.8mm	TE

Specifications

General Performance	
Operating principle	Oxidation and reduction of semiconductor
Measurement range	CO/HC and NOx (Extensible detection NH3 or SO2 Gas, needs to be customized)
Air velocity range	≤10 m/s
Digital output	LIN/PWM
IP rating	IP6K7
Module weight	≤15 g
Dimensions	45*31*35.8 mm
Environmental	
Working temperature	-40~+85°C
Storage temperature (Short term range, max of 2 hours)	-40~+125°C
Relative Humidity	0-99%RH (non-condensing)
Electrical	
DC Supply Voltage	9V ~16.2V (Normal Supply 12 VDC)
Supply current	≤40mA
Quiescent current	≤100 μA

Communication

1.LIN Block Diagram

The Cubic AQM Sensor is connected to LIN-Bus as a slave and is communicating on two separated LIN Frames with the LIN Master. One of these frames is a sending frame, one is a receiving frame. LIN Signal Description:

Signal Description 信号描述	Response Error 状态信息位	Start Byte 起始字节	Start Bit 起始位	Bit Length (Bit) 信号长度	Resolution 精度	Offset 偏移量	Signal Min. Value (phys) 物理最小值	Signal Max. Value (phys) 物理最大值	Signal Min. Value (Hex) 总最小值	Signal Max. Value (Hex) 总最大值	Unit 单位	Initial Value (Hex) 初始值	Invalid Value 无效值	Signal Value Description (hex) 信号值描述	Remark 备注	LIN_Master	ANM
Cmd		0	0	4	-	-	-	-	-	-	-	0x0	-	0x0.normal_init	Fixed 0,Reserve	S	R
WorkMode		0	4	1	-	-	-	-	-	-	-	0x0	-	0: Low standard 1: High standard		S	R
WashWash		0	5	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		S	R
Reserve		1	6	2	-	-	-	-	-	-	-	0x0	-	0: OFF 1: ON		S	R
Reserve		8	0	56	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		S	R
NO2 Value		0	0	10	0.01	0	0	1000	0x000	0x3EB	ppm	0x0	1001-1022	0x000 Init 0x3FF Error		R	S
NO2 Range		0	2	2	-	-	-	-	-	-	-	0x0	-	0: High Range 1: Low Range		R	S
NO2 Level		1	4	4	1	0	0	10	0	0xA	-	0x0	11-15	0x0: init		R	S
CO Value		2	0	10	1	0	0	1000	0x000	0x3EB	ppm	0x0	1001-1022	0x000 Init 0x3FF Error		R	S
CO Range		2	2	2	-	-	-	-	-	-	-	0x0	-	0: High Range 1: Low Range		R	S
CO Level		3	4	4	1	0	0	10	0	0xA	-	0x0	11-15	0x0: init		R	S
NH3 Value		4	0	10	0.5	0	0	1000	0x000	0x3EB	ppm	0x0	1001-1022	0x000 Init 0x3FF Error		R	S
NH3 Range		4	2	2	-	-	-	-	-	-	-	0x0	-	0: High Range 1: Low Range		R	S
NH3 Level		5	4	4	1	0	0	10	0	0xA	-	0x0	11-15	0x0: init		R	S
Cmd Rsp		5	0	4	-	-	-	-	-	-	-	0x0	-	0x0.normal_init	Fixed 0,Reserve	R	S
WorkMode Rsp		5	4	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
WashWash Rsp		5	5	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
Power Voltage Error		5	6	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
Sensor Temperature Error		6	7	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
NO2 Heat Error		6	0	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
NO2 Sample Error		6	1	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
CO Heat Error		6	2	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
CO Sample Error		6	3	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
NH3 Heat Error		6	4	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
NH3 Sample Error		6	5	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
Reserve		6	6	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S
LIN Response Error	◆	7	7	1	-	-	-	-	-	-	-	0x0	-	0: Normal 1: Error		R	S

Remark: LIN Communication overview as a block diagram of the frames.
More information, please contact Cubic Team.

2.PWM Signal Description

PWM signal	Air Quality	Low sensitivity (city mode) look up table		High sensitivity (country mode) look up table	
		CO/HC [ppm]	NO2 [ppb]	CO/HC [ppm]	NO2 [ppb]
90 ± 2%	Level 0	0 - 4	0 - 200	0 - 1	0 - 200
80 ± 2%	Level 1	4 - 8	200 - 400	1 - 2	200 - 400
70 ± 2%	Level 2	8 - 16	400 - 800	2 - 4	400 - 800
60 ± 2%	Level 3	16 - 32	800 - 1200	4 - 8	800 - 1200
50 ± 2%	Level 4	32 - 64	1200 - 1600	8 - 16	1200 - 1600
40 ± 2%	Level 5	>64	> 1600	> 16	> 1600

Classification levels

Air quality levels for CO/HC and NOx signals in different sensitivity modes.

气体测量量程 Gas measurement Range	CO/HC		NO2		NH3	
	1-1000 ppm		10-5000 ppb		100-5000 ppb	
空气质量等级 Air Quality Level	Low sensitivity (city mode)			High sensitivity (country mode)		
	CO/HC(ppm)	NO2 (ppb)	NH3 (ppb)	CO/HC(ppm)	NO2 (ppb)	NH3 (ppb)
Level-1	2.8	141.4	300	0.5	141.4	300
Level-2	4	200	600	0.7	200	600
Level-3	5.7	282.8	900	1	282.8	900
Level-4	8	400	1200	1.4	400	1200
Level-5	11.3	565.7	1500	2	565.7	1500
Level-6	16	800	1800	2.8	800	1800
Level-7	22.6	979.8	2100	4	979.8	2100
Level-8	32	1200	2400	5.7	1200	2400
Level-9	45.3	1385.7	2700	8	1385.7	2700
Level-10	64	1600	3000	11.3	1600	3000

Remarks:

- 1、 Can be reclassified according to the specific needs of OEM customers.
- 2、 Based on LIN can be divided into 10 levels at present, PWM can be divided into 5 levels at present, if PWM needs more level division, it needs to be customized

After-Sales Services and Consultancy

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