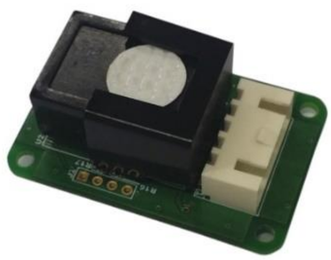
Formaldehyde Gas Sensor Module
(Low Ethanol Cross Sensitivity)

Product Data Sheet
Model #SSGSM-HCHO_LE

2023. Ver 1.1

Applications

- Ideal for portable instrument
- Air-quality monitor
- Air cleaner
- Air renewal system
- Smart home



Specifications

Performance Characteristics	
Operating Principle	2-Electrochemical gas sensor
Detection Gas	Formaldehyde(HCHO)
Measurement Range	0~1 ppm
Warm up Time	≤ 1 minutes
Resolution	0.01 ppm
Accuracy	≤ ±30% @ Full Range
Digital Signal Output	I2C
Electrical Characteristics	
Absolute Maximum Input Voltage	DC 6.5V
Operating Input Voltage Range	DC 5V±10%
Normal Operating Current	Max 18mA
Power Consumption	≤ 100mW
Start-up time for resister Read/Write	Min 30ms after Power On Reset
ESD	2KV
Environmental	
Operating Temperature	-10℃ to 40℃
Operating Humidity Range	20% to 90% Rh (Non condensation)
Pressure Range	800 to 1200 mbar
Recommended Storage Temperature	0℃ to 30℃

Cross sensitivity

Substance	Cross Sensitivity (%)
Ammonia	0
Ethanol	≤3
Acetaldehyde	0
Toluene	0
Acetic acid	0

Due to ongoing research and product improvement, specifications are subject to change without notice

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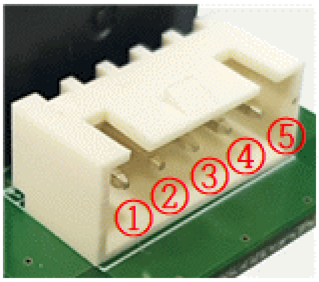
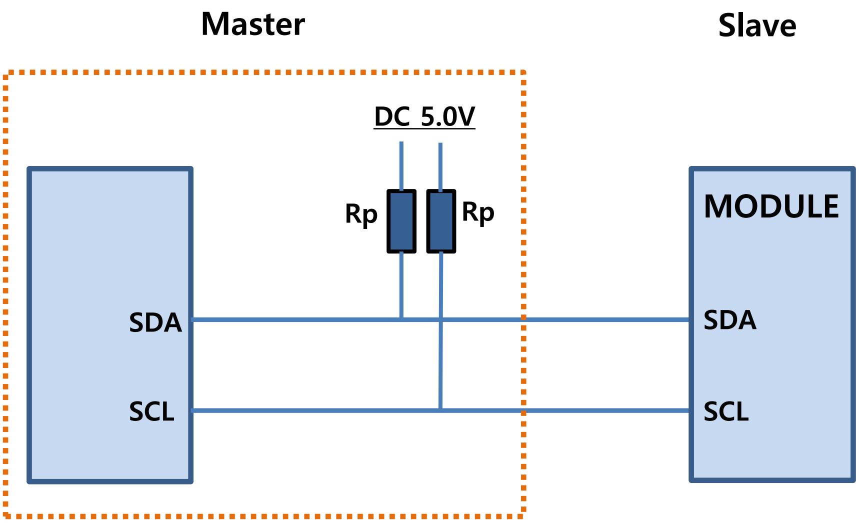
Pin Map



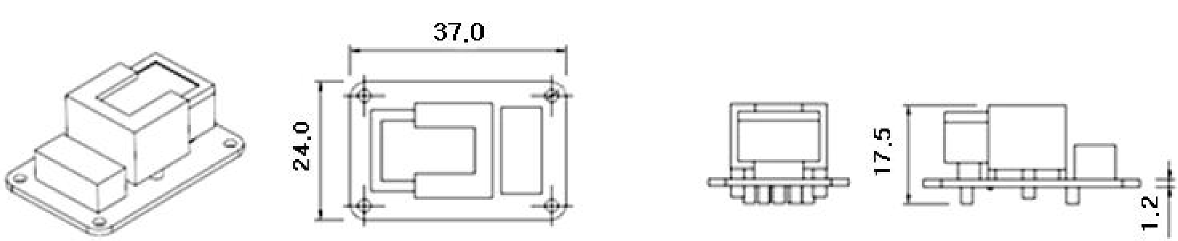
PIN	Instruction
Pin 1	VCC
Pin 2	SCL
Pin 3	SDA
Pin 4	RESET (input low width MIN 10us)
Pin 5	GND

Typical Circuit



Dimension

- Size : 24.0mm(w) x 37.0mm (d) x 17.5mm(h)
- Weight : 7g



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Electrical Characteristics

- DC Characteristics

(TA= -40°C ~ +85°C, VDD= 5.0V, VSS= 0V, f_{XIN}= 8MHz)

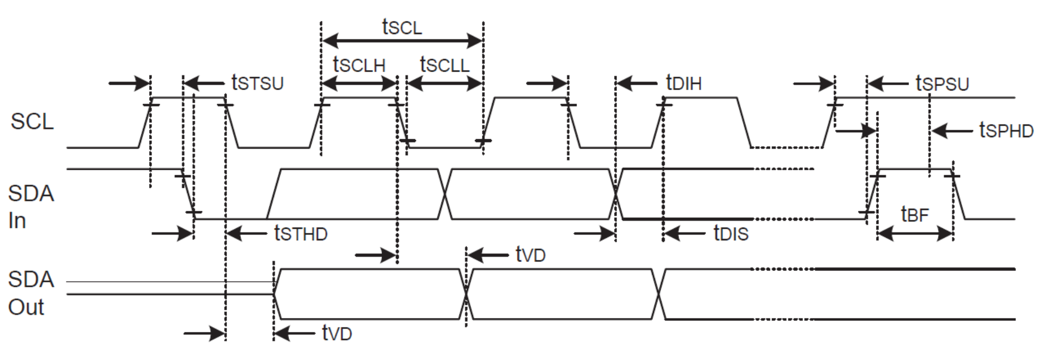
Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input High Voltage	V_{IH}	All input pins, RESET	0.8VDD	–	VDD	V
Input Low Voltage	V_{IL}	All input pins, RESET	–	–	0.2VDD	V
Output High Voltage	V_{OH1}	VDD= 5.0V, IOH= -20mA, RESET	VDD-1.5	–	–	V
	V_{OH2}	VDD= 5.0V, IOH= -10mA, I2C Port	VDD-2.0	–	–	
Output Low Voltage	V_{OL1}	VDD=5.0V, IOL= 15mA, RESET	–	–	1.0	
	V_{OL2}	VDD=5.0V , IOL= 160mA, I2C Port	–	1.5	3.0	V
Input High Leakage Current	I_{IH}	All input ports	–	–	1	μA
Input Low Leakage Current	I_{IL}	All input ports	-1	–	–	μA

- I2C Characteristics

(TA=-40°C ~ +85°C, VDD=5.0V)

	Symbol	High-Speed Mode		Unit
		MIN	MAX	
Clock frequency	$1/t_{SCL1}$	0	400	kHz
Clock High Pulse Width	t_{SCLH}	0.6	–	μs
Clock Low Pulse Width	t_{SCLL}	1.3	–	
Bus Free Time	t_{BF}	1.3	–	
Start Condition Setup Time	t_{STSU}	0.6	–	
Start Condition Hold Time	t_{STHD}	0.6	–	
Stop Condition Setup Time	t_{SPSU}	0.6	–	
Stop Condition Hold Time	t_{SPHD}	0.6	–	
Output Valid from Clock	t_{VD}	0	–	
Data Input Hold Time	t_{DIH}	0	1.0	
Data Input Setup Time	t_{DIS}	100	–	ns

- I2C Timing



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I2C Read/Write Flow

- Slave mode, max 400kHz Clock
- Sensor module address format : I2C Address + Direction bit
- I2C Address : 7bit, 0b0101101x
- Read/Write bit : Read(1), Write(0)
- Transmission order : MSB first transfer

> **Read command mode**

S	Slave Address							W	A	command								A
	0	1	0	1	1	0	1	0	0	b7	b6	b5	b4	b3	b2	b1	b0	0

S	Slave Address							R	A	Data 0								A
	0	1	0	1	1	0	1	1	0	b7	b6	b5	b4	b3	b2	b1	b0	0

Data 1 ~ n								A	BCC 0								A
b7	b6	b5	b4	b3	b2	b1	b0	0	b7	b6	b5	b4	b3	b2	b1	b0	0

BCC 1								A	P
b7	b6	b5	b4	b3	b2	b1	b0	1	

Mark	Meaning
□	Master → Slave
■	Slave → Master
S	Start
P	Stop
A	Acknowledge 0 - low, 1 - high
R, W	Read - 1, Wirt - 0
Data 0, 1	Data 0 - High byte Data 1 - Low byte
BCC 0, 1	CRC16 - CCITT(0x1021, XModem) BCC 0 - CRC16 High Byte BCC 1 - CRC16 Low Byte Calculation : Command, Data 0, 1 ~ Data n

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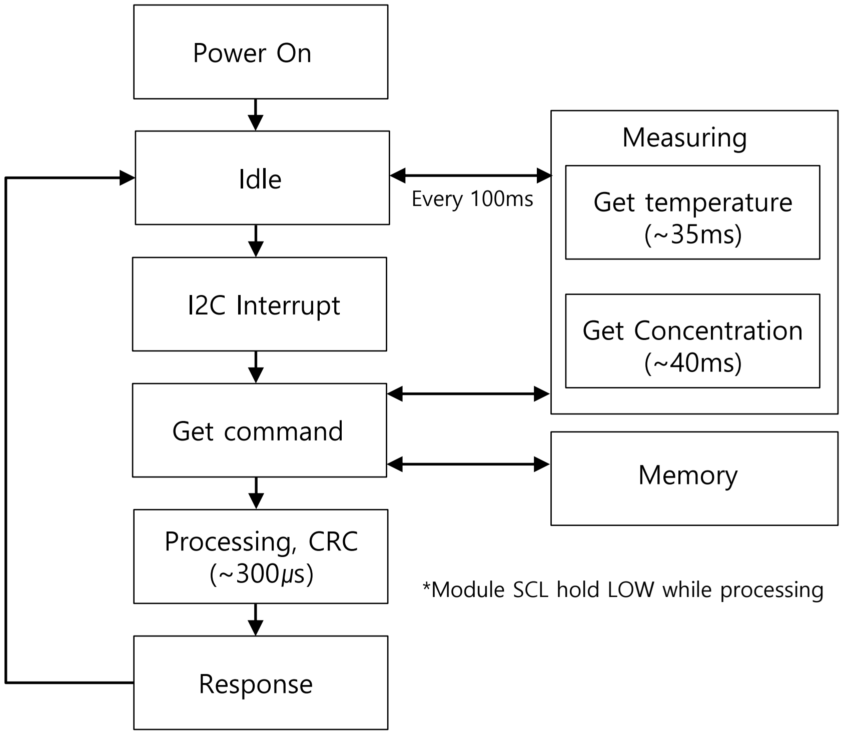
Functional Map

Function		Command	R/W	Length [Byte]	Description
Device Information	Version	0xA0	R	2	[0~255].[0~255] Ex) [0x01 0x0F] = 1.16
	Serial Number	0xC4	R	8	
Measuring Data	Module Temperature	0xB0	R	2	16 bit signed integer Ex) 0x0010 = 16℃, 0xFFFF = -1℃
	Gas Concentration	0xB4	R	2	≥ 0, Unit : ppb(parts per billion)
	ADC Data	0xB2	R	2	≥ 0
Calibration Data	Zero Cal.	0xC0	R	2	≥ 0
	Span Cal.	0xC2	R	2	≥ 0

State Machine



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Functional Example

> Reading gas(HCHO) concentration

S	Slave Address							W	A	Reading concentration(0xB4)								A
	0	1	0	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0

S	Slave Address							R	A	Data 0								A
	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0

Data 1								A	BCC 0								A
0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	1	0

BCC 1								A	P
0	1	1	1	0	1	0	1	1	

- BCC Calculation : CRC16(Reading concentration command, Data0, Data1)

> Reading serial Number

S	Slave Address							W	A	Reading serial number	A
	0	1	0	1	1	0	1	0	0	0xC4	0

S	Slave Address							R	A	Data 0	A
	0	1	0	1	1	0	1	1	0	0x36	0

Data 1	A	Data 2	A	Data 3	A	Data 4	A	Data 5	A	Data 6	A	Data 7	A
0x35	0	0x32	0	0x35	0	0x39	0	0x39	0	0x39	0	0x39	0

BCC 0								A	BCC 1								A	P
1	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	1	1	

- BCC Calculation : CRC16(Reading serial number command, Data0~Data7)

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