Indoor Air Quality Radon Sensors

PM04

Features

Type : pulsed ion chamber

First data out : < 60min

Data interval : 10min update (60min moving average)

Sensitivity : 0.30cpm/pCi/L

Operating range : 10~50℃, RH < 80%

Range : 0.10 ~ 99.99 pCi/L

Precision : < ±15% at 0.10 ~ 99.99 pCi/L

Accuracy : < ±15% (min. error <±0.46pCi/l)

Power : DC 12 ± 0.1V, 38mA (12V DC adapter)

Size : Φ63 x H69 (mm)

Data communication : I2C

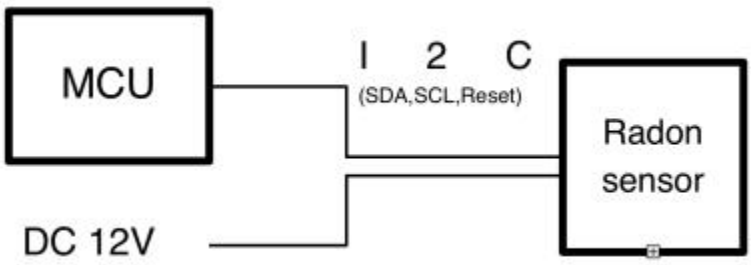
(* All specifications are measured within temperature 20℃ ± 2℃, humidity 20% ~ 60%)

Description

The Radon Sensor is a radon gas measurement sensor. The time it takes to display the effective measured value is only 1 hour, compared to 24 to 48 hours for other foreign popular equipment, and the uncertainty is within 15%. The small size HS-100C Radon Sensor, which can be applied to various products such as air quality monitors, air purifiers, indoor air conditioners, ventilation fans, and ventilation systems, has a high sensitivity of 0.30 cpm/pCi/L.

Pin Description

Pin No	Name	Description
1	GND	Ground
2	Reset	TTL in level 3.0V
3	I2C SDA	TTL in out level 3.0V
4	I2C SCL	TTL in level 3.0V
5	+12V	Vcc input



Absolute maximum rating

Parameter	Symbol	Rating	Unit
Supply voltage	Vcc	-0.3 to 15	V
I/O terminal voltage	V_IO	-0.3 to 3.3	V
Storage temperature	Ts	-20 ~ 85	ºC
ESD rating	-	±2	kV

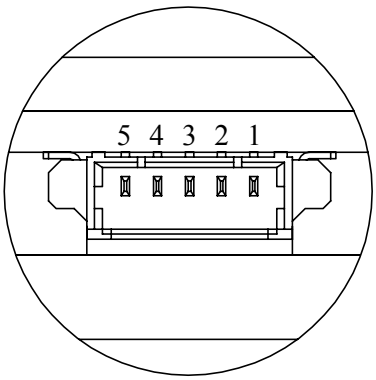
Recommemded operating conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	Vcc	11.8	12	12.2	V
Proper temperature	Ta	10	-	50	ºC
Max Temperature	Tmax	-10	-	60	ºC
Humidity	RH	0	-	80	%

Electrical characteristics

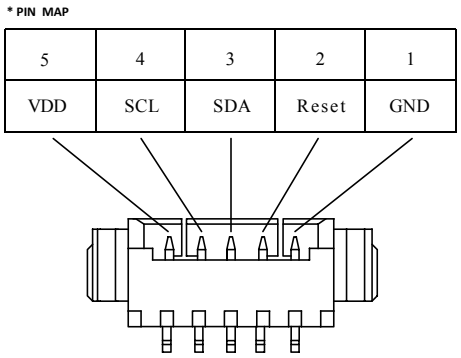
Parameter	Symbol	conditions	Min	Typ	Max	Unit
Current consumption	Icc	-	30	-	50	mA
Base noise level	Vn_pp	-	20	35	50	mV
α- decay signal peak	Vp	background test	1	2.5	4	V
α- decay signal pulse width	Tw	FWHM	50	300	600	ms
Threshold voltage	Vth	reference voltage for comparator	-	1.5	-	V

General geometry

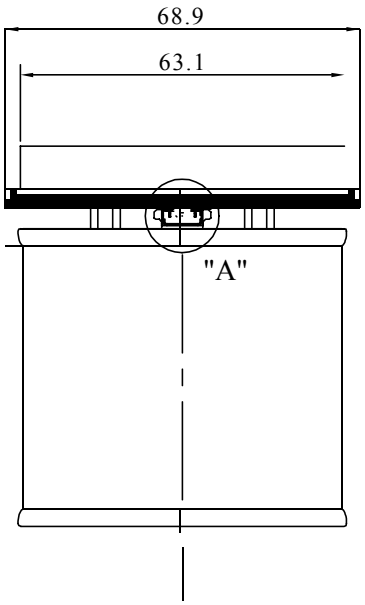


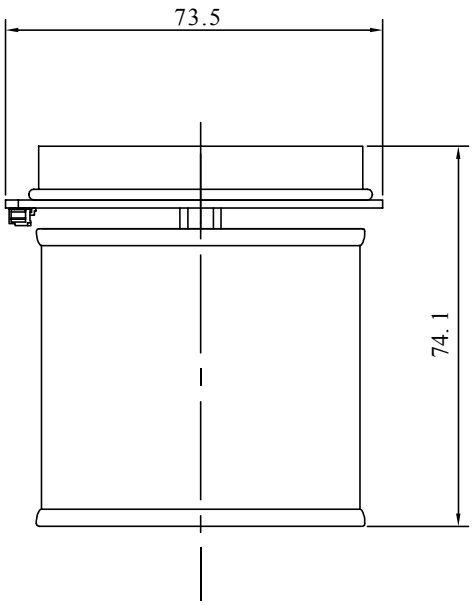
DETAIL "A"

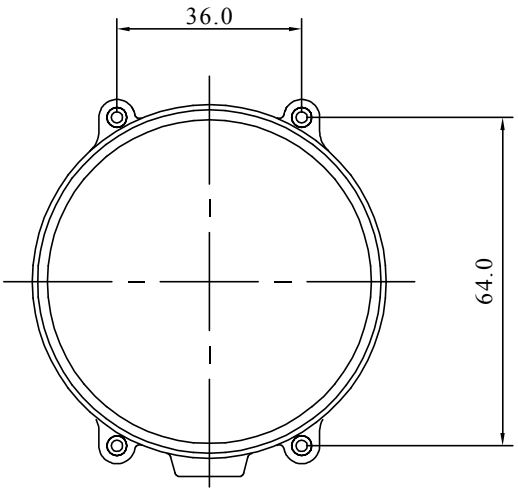
Scale 5 : 1

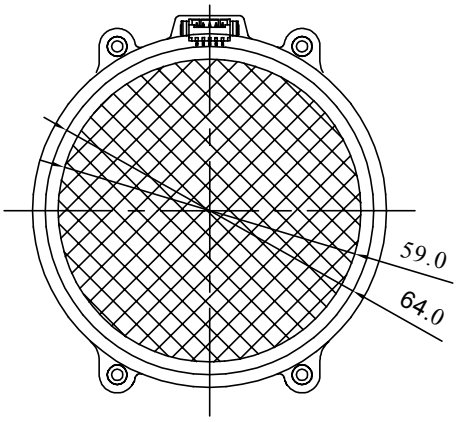


5P CONNECTOR - 12505WR-05









Register for Pulse Count

A) Previous 10 minutes value

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x00	AVERAGE_BEFORE_10MIN_L	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x01	AVERAGE_BEFORE_10MIN_H	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00

- **Updated every 10 minutes.**
- **The current 10 minute count value (Address 0x02, 0x03) is moved every 10 minutes of the elapsed measurement time.**

B) Current 10- minute count value

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x02	AVERAGE_CURRNET_L	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x03	AVERAGE_CURRENT_H	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00

- **The elapsed measurement time is reset to 0 every 10 minutes and counted again.**

C) Total count value after power on

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x04	TOTAL COUNT_LL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x05	TOTAL COUNT_LH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00
0x06	TOTAL COUNT_HL	R	H[23]	H[22]	H[21]	H[20]	H[19]	H[18]	H[17]	H[16]	0x00
0x07	TOTAL COUNT_HH	R	H[31]	H[30]	H[29]	H[28]	H[27]	H[26]	H[25]	H[24]	0x00

Register for Time Count

A) Elapsed time of measurement

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x08	TIME COUNT_SECONDS	R	10Seconds(0-5)				Seconds(0-9)				0x00
0x09	TIME COUNT_MINUTES	R	10Minute(0-5)				Minute(0-9)				0x00
0x0A	TIME COUNT_HOURS	R	10Hours(0-2)				Hours(0-9)				0x00
0x0B	TIME_COUNT_DATE_L	R	10Date(0-9)				Date(0-9)				0x00
0x0C	TIME_COUNT_DATE_H	R	-				100Date(0-9)				0x00

Register for Time Count

A) Elapsed time of measurement

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x08	TIME COUNT_SECONDS	R	10Seconds(0-5)				Seconds(0-9)				0x00
0x09	TIME COUNT_MINUTES	R	10Minute(0-5)				Minute(0-9)				0x00
0x0A	TIME COUNT_HOURS	R	10Hours(0-2)				Hours(0-9)				0x00
0x0B	TIME_COUNT_DATE_L	R	10Date(0-9)				Date(0-9)				0x00
0x0C	TIME_COUNT_DATE_H	R	-				100Date(0-9)				0x00

Register for Radon Data

A) Average value of the previous 10 minutes (pCi, Bq)

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x0D	pCi/L_L (소수점 이하)	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x0E	pCi/L_HL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x0F	pCi/L_HH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00
0x10	Bq/m³_L (소수점 이하)	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x11	Bq/m³_HL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x12	Bq/m³_HH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00

- **Updated every 10 minutes.**
- **pCi 123.45 : 0x0D = 45 (0x2D), 0x0E = 123 (0x7B), 0x0F = 0 (0x00)**

B) 1-hour moving average value (pCi, Bq)

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x13	1Hour pCi/L_L (소수점 이하)	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x14	1Hour pCi/L_HL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x15	1Hour pCi/L_HH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00
0x16	1Hour Bq/m³_L (소수점 이하)	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x17	1Hour Bq/m³_HL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]	0x00
0x18	1Hour Bq/m³_HH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]	0x00

- **Updated every 10 minutes.**
- **Before 60 minutes of elapsed measurement time, average up to that time (in 10-minute increments) Calculated value for 10 minutes after 10 minutes / Average calculated value for 30 minutes after 30 minutes.**

Radon Sensor Communication Protocol (I2 C)

- All data are expressed as HEX values.
- Pulse count and time count pause when vibration is detected. (vibration status: 1)
- Sensor operation sequence

1. Power supply

2. Boot

- Sensor Status: 2 (Boot Status)
- INITIAL_BOOT: Increases from 0 to 100.
- No pulse count and no measurement time count until booting is complete (1 0 0 %).

3. Measure

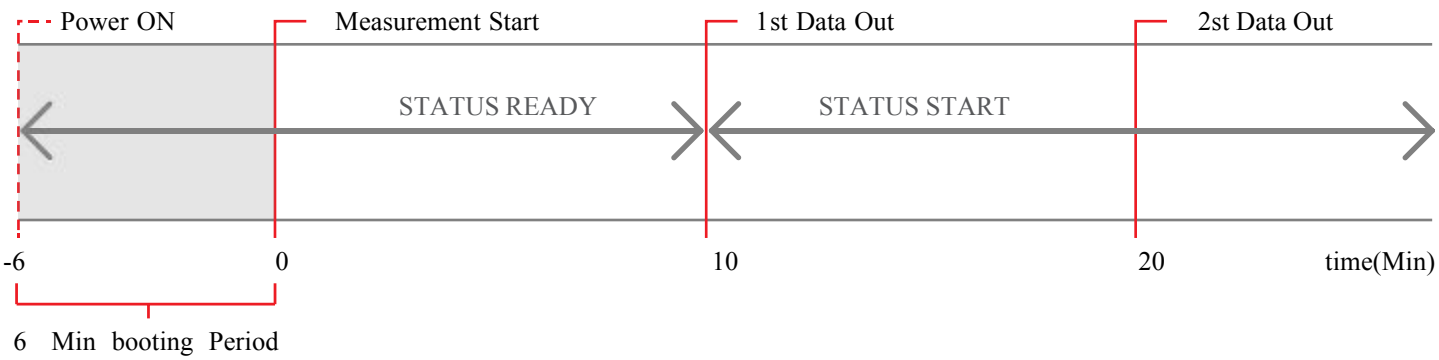
- Sensor status, I2 C status: Read measurement data after checking Noraml Status.
- Measurement data is updated every 1 second. (Some registers are updated every 1 0 minutes)

I2C Slave Address (0x6B)

1	1	0	1	0	1	1	R/W

Write : 0xD6 / Read : 0xD7

Operration Sequence



Register for Status Information

A) Booting progress after power on

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x19	INITIAL_BOOT	R	%(0-100)								0x00

B) Sensor status

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Init Value
0x1A	STATE	R	Sensor status[7][6]		I2C status[5][4]		vibration status[3][2]		Error status[1][0]		0x01

- **Sensor Status[7][6]** **0:**
  Normal status
  1: Abnormal status
  2: Boot status (during initial boot% display time)

- **I2C Status[5][4]**
  0: Normal status
  1: Normal w/correction
  2: I2C Error

- **Vibration Status[3][2]**
  0: Normal status (no vibration detected)
  1: Abnormal status (vibration detected)

- **Error Status[1][0]**
  01: In case I2C communication is not normal, it is unconditionally assigned to 01 after power is applied. Otherwise, if the value is continuously read for more than 3 seconds, the sensor is reset.

Register for Serial Number

A) Unique sensor number

ADDR	REGISTER	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x1B	Serial_Number_LL	R	H[7]	H[6]	H[5]	H[4]	H[3]	H[2]	H[1]	H[0]
0x1C	Serial_Number _LH	R	H[15]	H[14]	H[13]	H[12]	H[11]	H[10]	H[9]	H[8]
0x1D	Serial_Number _HL	R	H[23]	H[22]	H[21]	H[20]	H[19]	H[18]	H[17]	H[16]
0x1E	Serial_Number _HH	R	H[31]	H[30]	H[29]	H[28]	H[27]	H[26]	H[25]	H[24]

Note

1. Metal circle

There is a metal pie chart at the bottom of the sensor. (Appropriate spacing> 1mm)

2. Electrical noise and magnetic influence

The sensor may affect the sensor output as a noise source(hair dryer, high voltage discharger, high voltage transceiver, etc.).

It can also have an effect if you come close to a material such as magnetic (magnet).

3. Effects of vibration

The sensor's output signal can also be affected by mechanical shock or vibration. Therefore, the sensor is designed to be used only in a stationary state. Before use, make sure the device does not move and works normally.

4. Influence of wind speed

Normally, the sensor value increases when strong wind blows, and the sensor is affected by wind speeds of 0.5m/s or more. So, the wind speed is less than 0.5m/s.

5. Effect of moisture

Environments where the sensor has a relative humidity of 80% or more may be affected. Design your applicationso that there is no excess moisture present.

6. Cleaning

When cleaning the sensor, use a suitable electronic PCB cleaner.