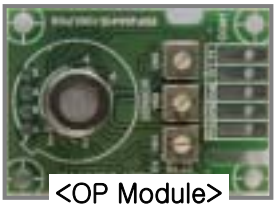
SMKt-type Sensor

Smoke Sensor

– for the detection of Hydro Carbon, Smoke, Tobacco, Organic Solvent

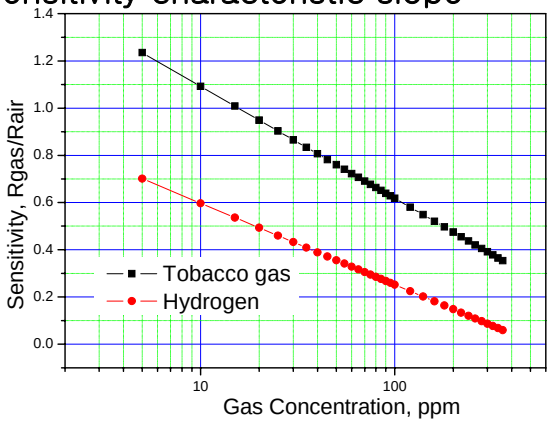
It is applied detection of reducing gases (Alcohol, CO, H2, HC, LPG/NG, Tobacco) for air cleaner and ventilation with installing electric • electron machine.

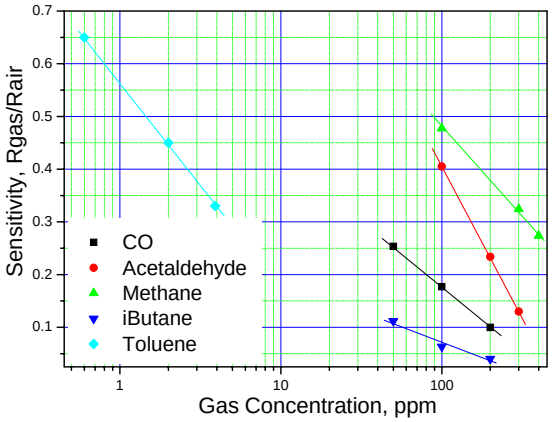

<Package>


<OP Module>

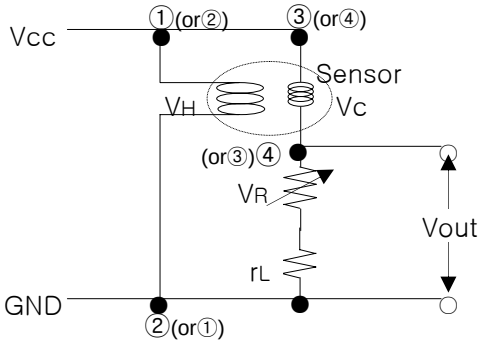

<RL Module>

1. Sensitivity characteristic slope



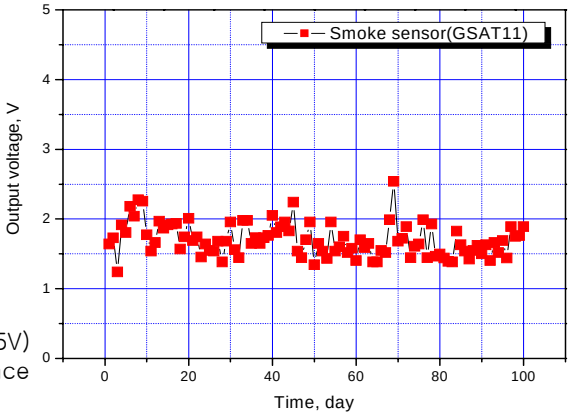


2. Basic Measuring Circuit & Stability



Vcc : Circuit Voltage(5V) VH : Heater Voltage(5V)
RL : Load Resistance Rs : Sensor Resistance
(RL=VR+rL) None polarity

Long Term Stability
- Room condition & temperature



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3. Specifications

3.1 Package (GSAT11), MOQ : None

a. Characteristics

Index		Spec. & Test condition					
Circuit Voltage	Vc	Sensor input Voltage :1~12Volt, Sensor Resistance : refer to Rank table					
	VH	Heater input voltage : 5volt±1%, Heater Resistance : 29.0Ω±2.0Ω					
	PH	Power consumption : Less than 390㎽, Inrush current : Less than 200mA					
Characteristics of sensitivity (β) (Rs,gas / Rs,air)	Gases	Methane	Alcohol	*TMA	Toluene	Acetaldehyde	
	Concentration	500ppm	30ppm	0.1ppm	15ppm	100ppm	
	Sensitivity	0.6≤	0.3≤	0.3≤	0.3≤	0.4≤	
Guarantee	- 3years, - Calibration interval 1years recommended						
Operating environment	- Temp. : -10 ~ 50℃, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -10 ~70℃, Humidity : 0 ~90%RH						
Reaction time(T90)	- Reaction Time(T90) : Less then 10sec - Recovering Time(T90) : Less then 30sec						

*TMA :Tri-Methylamine, * Rs,gas : Output Resistance after gas injection
* Rs,air : Output Resistance in Clean air * Sensitivity(β) = Rgas/Rair

b. Sensitivity of gas concentration, Error : ±15% (Before compensation of temp. & humidity)

* Ref. → RL : 100kΩ, Sensor resistance : 10kΩ, Vout,air : 1.0volt (Input Voltage 5volt)
* Tobacco (ESSE 1.0) 1ea Cigarette Con. → amount 80ppm(20㎥ in door)

Hydrogen 121124			
Con. (ppm)	Sensitivity	Con. (ppm)	Sensitivity
0	1.000	375	0.227
25	0.531	400	0.220
50	0.453	425	0.213
75	0.408	450	0.207
100	0.376	475	0.201
125	0.350	500	0.195
150	0.330	525	0.189
175	0.313	550	0.184
200	0.298	575	0.179
225	0.284	600	0.174
250	0.273	625	0.170
275	0.262	650	0.165
300	0.252	675	0.161
325	0.243	700	0.157
350	0.235	725	0.153

$(Sensitivity) = 0.892 - 0.25849 \times Log_{10}(ppm)$

Tobacco 121124			
Con. (ppm)	Sensitivity	Con. (ppm)	Sensitivity
0	1.00	1500	0.286
100	0.74	1600	0.275
200	0.62	1700	0.265
300	0.55	1800	0.255
400	0.51	1900	0.246
500	0.47	2000	0.238
600	0.44	2100	0.229
700	0.41	2200	0.222
800	0.39	2300	0.214
900	0.37	2400	0.207
1000	0.35	2500	0.200
1100	0.34	2600	0.194
1200	0.32	2700	0.187
1300	0.31	2800	0.181
1400	0.30	2900	0.175

$(Sensitivity) = 1.506 - 0.384 \times Log_{10}(ppm)$

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c. Sensor connection

After confirm Sensor Resistance (Rs) and RL (Refer to '3.1-d'), Please connect Basic measuring circuit('2').

(Caution : Sensor Resistance can be changed, talk over my company)

- Heater(DC 5volt ± 3%) → ① : Vcc ② : GND, None Polar
- Sensor(DC/AC 0 ~ 12volt) → ③ : Vcc ④ : GND, None Polar

d. Release

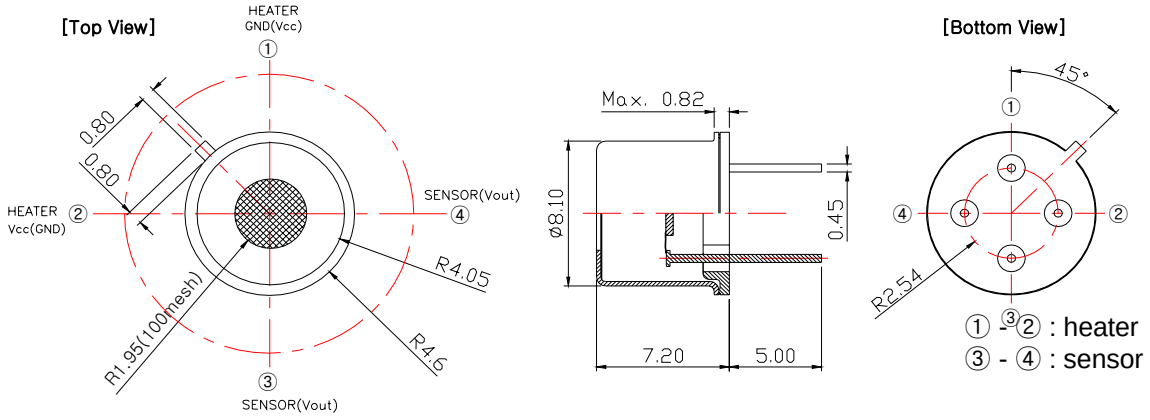
GSAT11-D■ ■

D ■ ■ : Classified by Sensor resistance ex) D11 -> Sensor Ra(Rs,air) : 101 ~ 128kΩ

- Sensor Resistance Table (Only package) Rank Table No.:D

Rank	RL(kΩ)	Rs(kΩ)	Rank	RL(kΩ)	Rs(kΩ)	Rank	RL(kΩ)	Rs(kΩ)
D05	6.7	23.8~30.3	D09	17.4	62.4~79.3	D13	45.3	163~206
D06	8.5	30.3~38.5	D10	22.1	79.3~101	D14	57.6	206~262
D07	10.7	38.5~48.7	D11	28.0	101~128	D15	73.2	262~333
D08	13.7	48.7~62.4	D12	35.7	128~163	D16	93.1	333~424

e. Structure and Dimensions



f. Caution

- Please, avoid flux
- If you will do using FR-4(Epoxy PCB), have a gap of 1mm from PCB side.
- In station more than 50mm from sensor side, should be injected gases.

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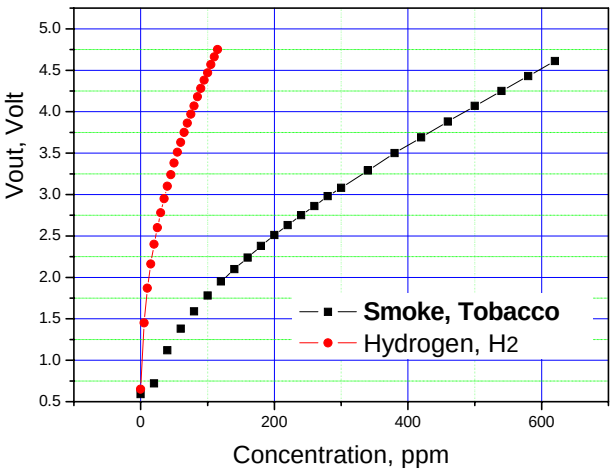
3.2 OP Module (GSAT11-P1xx), MOQ : None

a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption: Less than 460㎽, Inrush current: Less than 140mA
Guarantee		- 2years over - Calibration interval 1years recommended
Worm up Time (T90)		- Less then 300sec
Reaction time(T90)		- Reaction Time(T90) : Less then 5sec - Recovering Time(T90) : Less then 30sec

b. Output data sheet by gas concentration

- Output data : 0.5 ~ 5Volt
- Relay Output : More than 4.0Volt



Hydrogen / Smoke

$$H_2(ppm) = 4.425 - 10.573 * (Vout)^2 + 7.134 * (Vout)^2$$

- Error : ±7% (Before temp. & humidity)

Hydrogen 100222			
Con. (ppm)	Output (Volt)	Con. (ppm)	Output (Volt)
0	0.65	60	3.63
5	1.45	65	3.75
10	1.87	70	3.86
15	2.16	75	3.97
20	2.40	80	4.07
25	2.60	85	4.18
30	2.78	90	4.28
35	2.95	95	4.38
40	3.10	100	4.47
45	3.24	105	4.57
50	3.38	110	4.66
55	3.51	115	4.75

Tobacco 100222			
Con. (ppm)	Output (Volt)	Con. (ppm)	Output (Volt)
0	0.65	240	2.75
20	0.72	260	2.86
40	1.12	280	2.98
60	1.38	300	3.08
80	1.59	340	3.29
100	1.78	380	3.50
120	1.95	420	3.69
140	2.10	460	3.88
160	2.24	500	4.07
180	2.38	540	4.25
200	2.51	580	4.43
220	2.63	620	4.61

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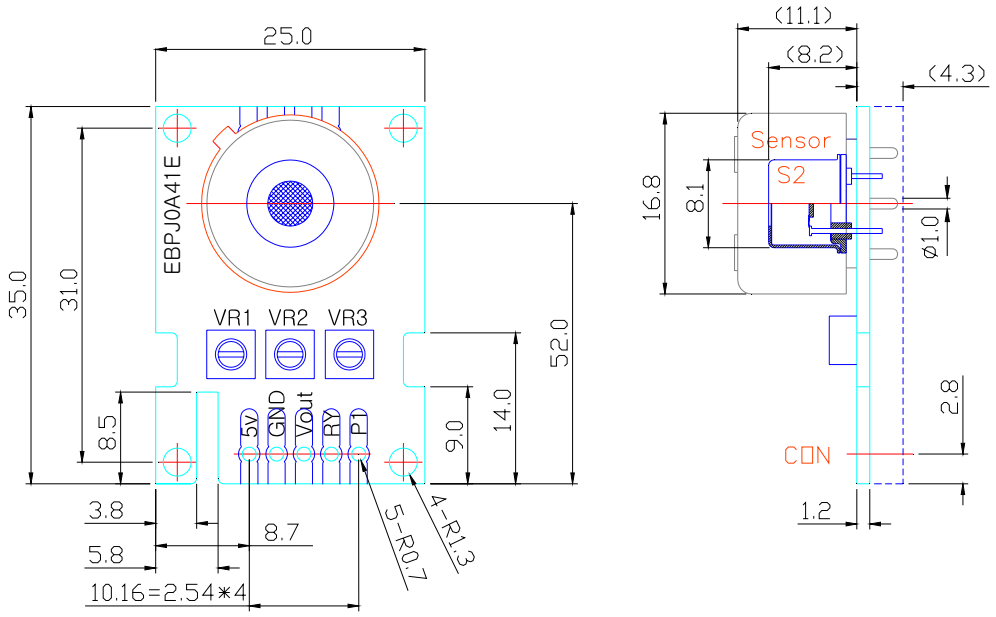
c. Structure and Dimensions



VR1 : Control of initial value in clean air
VR2 : Gain (Control of sensitivity)
VR3 : Offset (Level shift)

d. Data output

□ □ □ □
① ② ③ ④

① Vcc : 5.0volt
② GND
③ Data(Vout, analogue signal)
④ Relay

e. Relay Output

Hi(4.0~4.1volt) output at 50ppm(H_2)
Hi(4.0~4.1volt) output at 300ppm(Smoke)

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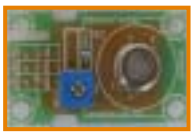


3.3 RL Module(GSAT11-P3xx), MOQ : More than 1,000pcs

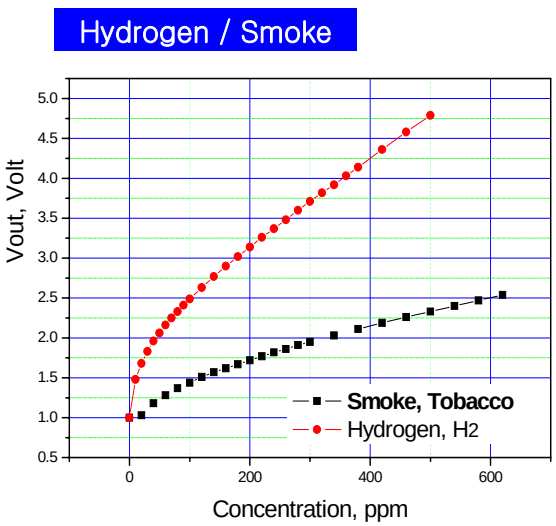
a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 450㎽ 이하, Inrush current : Less than 140mA
Characteristics of Output data		Refer to Datasheet
Guarantee		- 2years over - Calibration interval 1years recommended
Operating environment		- Temp. : -10 ~ 50℃, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -20 ~70℃, Humidity : 0 ~90%RH
Reaction time(T90)		- Reaction Time(T90) : Less then 10sec - Recovering Time(T90) : Less then 180sec

b. Output data sheet by gas concentration

Vout,air : 1.0volt (Input Voltage : 5volt)

- Error : ±15% (Before temp. & humidity)



Hydrogen 100222			
Con. (ppm)	Volt	Con. (ppm)	Volt
0	1.00	140	2.77
10	1.48	160	2.90
20	1.68	180	3.02
30	1.83	200	3.14
40	1.96	220	3.26
50	2.06	240	3.37
60	2.16	260	3.48
70	2.25	280	3.60
80	2.33	300	3.71
90	2.41	320	3.82
100	2.49	340	3.92
120	2.63	360	4.03

Tobacco 100222			
Con. (ppm)	Volt	Con. (ppm)	Volt
0	1.00	240	1.82
20	1.03	260	1.86
40	1.18	280	1.91
60	1.28	300	1.95
80	1.37	340	2.03
100	1.44	380	2.11
120	1.51	420	2.19
140	1.57	460	2.26
160	1.62	500	2.33
180	1.67	540	2.40
200	1.72	580	2.47
220	1.77	620	2.54

$* H_2(ppm) = 10^{-1.016+1.744*(Vout)-216*(Vout)^2}$

* Tobacco (ESSE 1.0) 1ea Cigarette Con.
→ amount 80ppm(20㎥ in door)

c. Sensor connection

- It should be noted that Con1, Con2 are different to connection.

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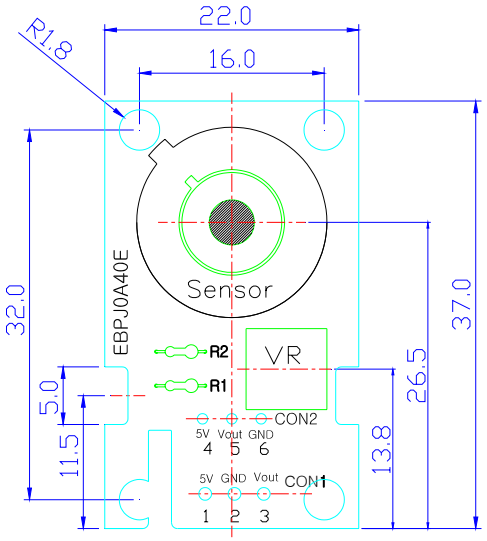
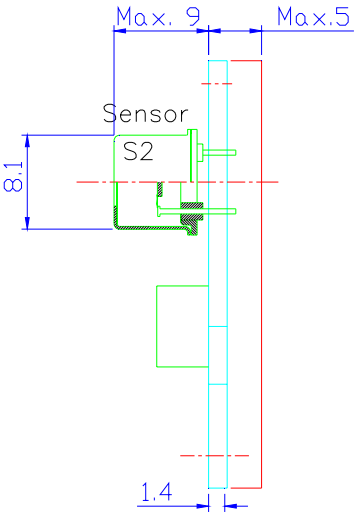
d. Structure and Dimensions



[Top View(2/1)]



[Side View]

e. Data output **(Should be caused CON1, CON2 connection)**

CON1 □ □ □
① ② ③

CON2 □ □ □
④ ⑤ ⑥

①, ④	→	Vcc : 5.0volt
②, ⑥	→	GND
③, ⑤	→	Data(Vout, analogue signal)

3.4 Product code & characteristics

Product code	Consumption	Circuit	Output	Worm-up time
GSAT11 – P1XX	390㎽ 이하	OP-Amplifying	Data : Analogue Relay : Hi(4V), Low(0V)	Long
Study– P2XX	↑	μ-processor	Data : Digital Open collect	short
– P3XX	↑	Basic Circuit	Data : Analogue	Long

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4. Comparison of Products

Index	GSAT11	GSAT11-**P11X**	GSAT11-**P21X**study	GSAT11-**P3XX**
Circuit	Package	OP-Module	MP-Module	RL-Module
Target Gas	HC, Smoke, Tobacco, Organic Solvent			
Accuracy	±15%	±7%	±7%	±10%
Measuring Circuit	Basic Circuit	Op-Amp	Micro Processor	Basic Circuit
Input Voltage	5Volt±3%	←	←	←
Output	0 ~ 4volt	0 ~ 4volt	Open collect	0 ~ 4volt
MOQ	None	None	None	More than 500ea

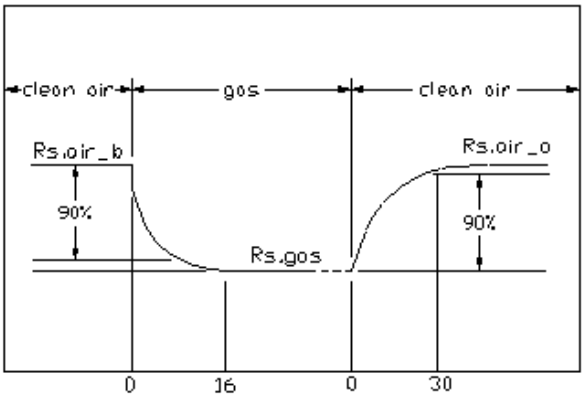
5. Reaction time(T90)

Reaction Time(T90) : Less then 10sec
[Between Rs,air_b & Rs,gas]

Recovering Time(T90) : Less then 30sec
[between Rs,gas & Rs,air_a]

Beginning stability time(T90) : Less then 10 min

Rs,air_b : Sensor Resistance without gases
Rs,gas : Sensor Resistance after blowing gases
Rs,air_a : Sensor Resistance removing gases



6. Application

* Hood, Ventilator
* Damper
* Gas Leak Alarm (Explosive gases)

7. Product code

Sensor : GS**AT11**

(A) Division Circuit → **A** : Smoke(HC) Gas of Sensing gas
(T) Chip Size → **T** : 1.5mm * 2.0mm
(1) Shape of Package → **1** : Metal Can
(1) Gas Sensing Characteristics → **1** : Normal

Module : GSAT11 – **P** ■ ■ ■
1 2 3

(1) Division Circuit → 1 : Op-amp circuit
2 : Micro processor Circuit
3 : Basic Circuit
(2) Sensing range → **1 : Standard**
(3) Connector → 0 : None
→ 1 : SMAW250-03G (YEONHO, Korea)

* This Specifications are summary spec. and there is notify to can change without announcement for the development products.

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