

## VOCT-T type Sensor

### VOCs Sensor

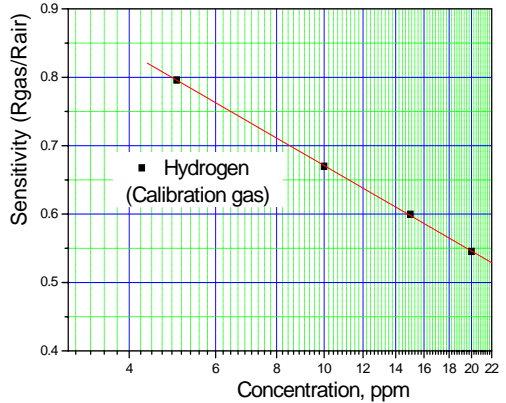
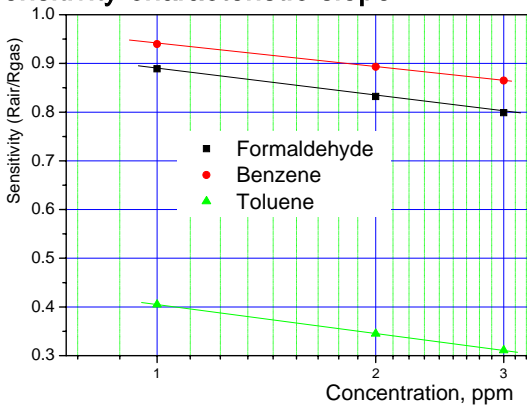
- for the detection of Formaldehyde, Toluene, Organic Solvent

VOCs (가, ) (EPA) 가 2~5 , 80~90% 가 가 ( )가 (SBS:Sick Building Syndrome) (indoor environment) 21

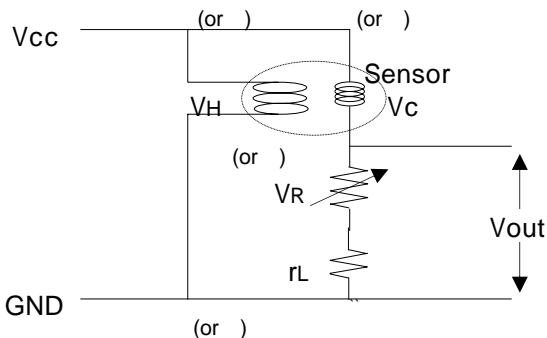
VOCs Sensor ( , , , , , ) 가 가



### 1. Sensitivity characteristic slope

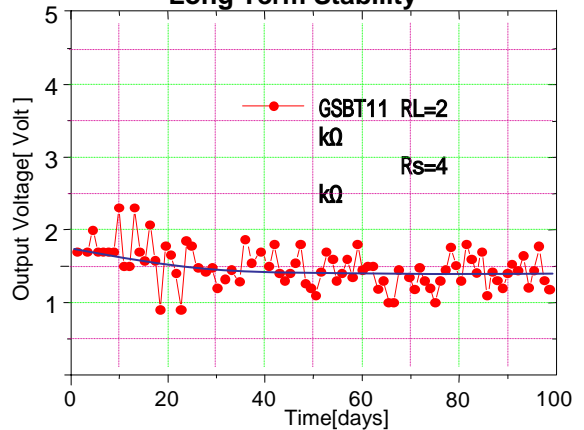


### 2. Basic Measuring Circuit & Stability



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

### Long Term Stability



### 3. Specifications

#### 3.1 Package (GSBT11), MOQ :



##### a. Characteristics

Index		Spec. & Test condition					
Circuit Voltage	Vc	Sensor input Voltage : 1 ~ 12V, Sensor Resistance : refer to Rank table					
	VH	Heater input voltage : 5volt±1%, Heater Resistance : 31.0 ±0.2					
	PH	Power consumption : 370mW , Inrush current : Less than 200mA					
Characteristics of sensitivity ( ) (Rs,gas / Rs,air)	Gases	Toluene		H <sub>2</sub>		i-butane	
	Concentration	1.0 ppm		100ppm		100ppm	
	Sensitivity	0.30	0.60	0.35	0.70	0.20	0.50
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						

\*Rs,gas : 가 , Rs,air :

b. 가 : : ±15% ( , )

→ RL : 100kΩ, Sensor resistance : 10kΩ

Vout,air : 1.0volt ( 가 5volt)

\* Formulation of Formaldehyde

$$Lpg(ppm) = (-3.665) + 3.009 * (Vout) + (-0.362) * (Vout)^2$$

\* Formulation of Toluene

$$Log(ppm) = (-9.234) + 5.249 * (Vout) + (-0.557) * (Vout)^2$$

[ Hydrogen ]

ppm	Vout	ppm	Vout	ppm	Vout
0	0.64	24	2.30	48	3.14
2	0.72	26	2.38	50	3.20
4	1.03	28	2.46	52	3.25
6	1.25	30	2.54	54	3.31
8	1.42	32	2.61	56	3.37
10	1.57	34	2.68	58	3.43
12	1.70	36	2.75	60	3.48
14	1.82	38	2.82	62	3.53
16	1.93	40	2.89	64	3.59
18	2.03	42	2.95	66	3.64
20	2.13	44	3.01	68	3.69
22	2.22	46	3.08	70	3.75

Toluene

ppm	Volt	ppm	Volt
0	1.00	24	3.27
2	2.10	26	3.33
4	2.33	28	3.38
6	2.49	30	3.44
8	2.62	32	3.49
10	2.73	34	3.54
12	2.83	36	3.59
14	2.92	38	3.64
16	3.00	40	3.69
18	3.07	42	3.74
20	3.14	44	3.78
22	3.20	46	3.82

Formaldehyde

ppm	Volt	ppm	Volt
0	1.00	24	1.42
2	1.16	26	1.43
4	1.22	28	1.44
6	1.26	30	1.45
8	1.29	32	1.46
10	1.31	34	1.47
12	1.33	36	1.47
14	1.35	38	1.48
16	1.37	40	1.49
18	1.38	42	1.50
20	1.40	44	1.50
22	1.41	46	1.51

#### c. Sensor connection

Sensor (Rs) RL ('3.1-b' ) Basic measuring circuit('2 ' )  
 .( : , )

- Heater( DC 5volt ± 3% ) → : Vcc : GND,
- Sensor( DC/AC 0 ~ 12volt ) → : Vcc : GND,

#### d.

GSBT11-E

E : rank ex) D11 -> Sensor (Rs,air) : 18.8 ~ 23.8kΩ  
 RI 5.23kΩ( circuit ) Vout=1.0volt

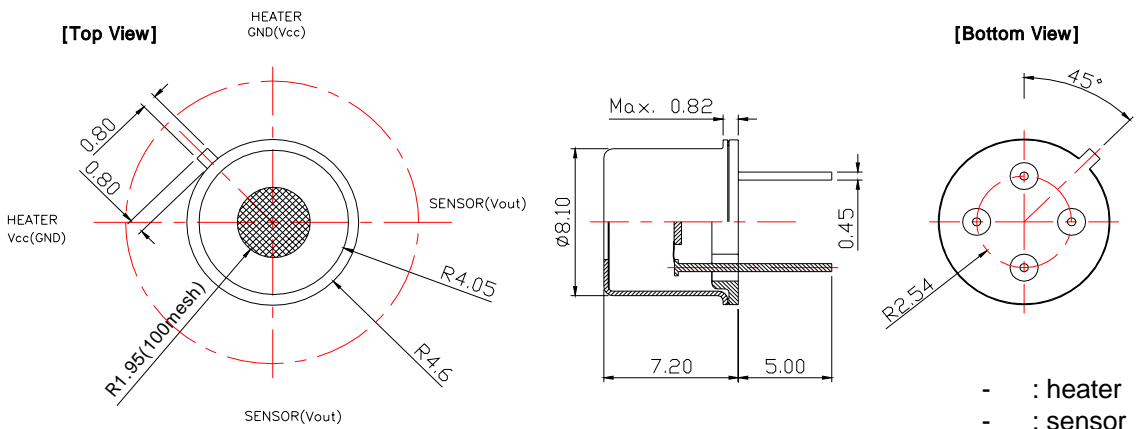
#### b. Sensor Resistance (Only package)

- Sensor Resistance Table(Only package) Rank Table No.:P(±0.05~0.10Volt)

Rank No.	D Rank Table (kΩ)		
	RL	Low limit	Hi limit
P03	0.20	0.74	0.84
P04	0.22	0.84	0.94
P05	0.25	0.94	1.06
P06	0.28	1.06	1.19
P07	0.32	1.19	1.35
P08	0.36	1.35	1.52
P09	0.40	1.52	1.71
P10	0.45	1.71	1.93
P11	0.51	1.93	2.18
P12	0.58	2.18	2.46

Rank No.	D Rank Table (kΩ)		
	RL	Low limit	Hi limit
P13	0.65	2.46	2.77
P14	0.73	2.77	3.12
P15	0.83	3.12	3.52
P16	0.93	3.52	3.97
P17	1.05	3.97	4.48
P18	1.18	4.48	5.03
P19	1.33	5.03	5.67
P20	1.50	5.67	6.39
P21	1.69	6.39	7.20
P22	1.91	7.20	8.14

#### e. Structure and Dimensions



### 3.2 OP Module (GSBT11-P1xx), MOQ :

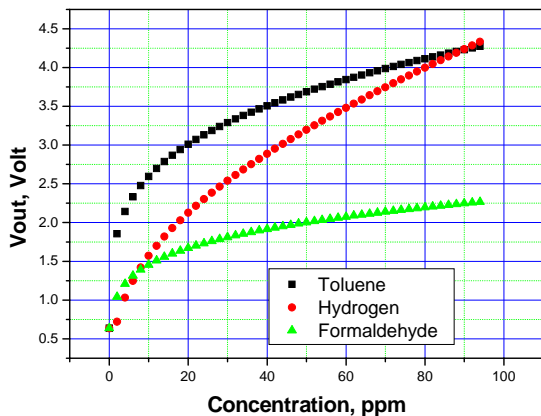


#### a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 460mW , Inrush current : Less than 140mA
Guarantee		- 3years over - Calibration interval 1years recommended
Worm up Time (T90)		- More then 300sec
Reaction time(T90)		- Reaction Time(T90) : Less then 5sec - Recovering Time(T90) : Less then 30sec

#### b. 가 data sheet

- Output data : 0.5 ~ 5Volt - : ±7% ( , )
- Relay Output : 4.0Volt



#### Toluene, Formaldehyde

##### - Toluene

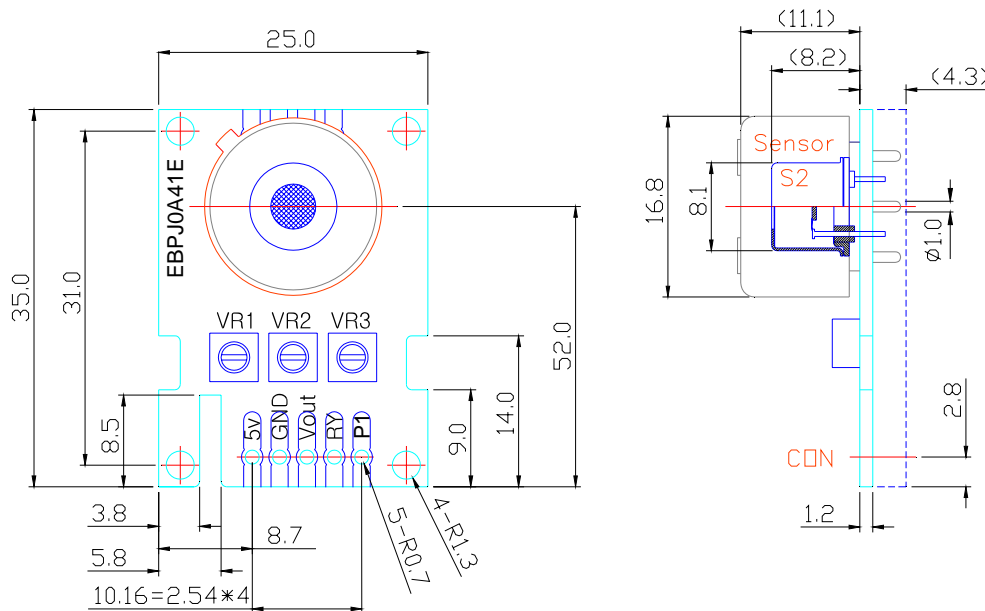
$$(ppm) = 10^{(-2.071+0.672*(VOLT))}$$

##### - Formaldehyde

$$(ppm) = 10^{(-0.867+1.274*(VOLT))}$$

[ Toluene ]						[ Hydrogen ]						[ Formaldehyde ]					
ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout	ppm	Vout
0	0.64	24	3.13	48	3.65	0	0.64	24	2.30	48	3.14	0	0.64	24	1.73	48	1.99
2	1.86	26	3.19	50	3.69	2	0.72	26	2.38	50	3.20	2	1.04	26	1.76	50	2.00
4	2.14	28	3.24	52	3.72	4	1.03	28	2.46	52	3.25	4	1.21	28	1.79	52	2.02
6	2.33	30	3.29	54	3.75	6	1.25	30	2.54	54	3.31	6	1.31	30	1.81	54	2.03
8	2.48	32	3.34	56	3.78	8	1.42	32	2.61	56	3.37	8	1.39	32	1.83	56	2.05
10	2.60	34	3.38	58	3.82	10	1.57	34	2.68	58	3.43	10	1.46	34	1.86	58	2.06
12	2.70	36	3.42	60	3.85	12	1.70	36	2.75	60	3.48	12	1.51	36	1.88	60	2.07
14	2.79	38	3.47	62	3.87	14	1.82	38	2.82	62	3.53	14	1.56	38	1.90	62	2.09
16	2.87	40	3.51	64	3.90	16	1.93	40	2.89	64	3.59	16	1.60	40	1.92	64	2.10
18	2.94	42	3.54	66	3.93	18	2.03	42	2.95	66	3.64	18	1.64	42	1.93	66	2.11
20	3.01	44	3.58	68	3.96	20	2.13	44	3.01	68	3.69	20	1.67	44	1.95	68	2.13
22	3.07	46	3.62	70	3.99	22	2.22	46	3.08	70	3.75	22	1.70	46	1.97	70	2.14

#### c. Structure and Dimensions



- VR1 : reference
- VR2 : Gain ( )
- VR3 : Offset (Level shift)

#### d. Data output

- Vcc : 5.0volt
- GND
- Data(Vout, analogue signal)
- Relay

#### e. Relay Output

- Max. output range H2 340ppm : Hi(4.0~4.1volt) output at 70ppm(H2)
- : Hi(4.0~4.1volt) output at 480ppm(Smoke)



### 3.3 RL Module(GSBT11-P3xx), MOQ : 500pcs

#### a. Characteristics

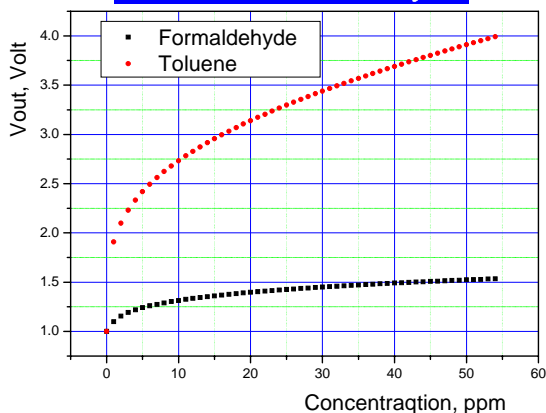
Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : $5 \pm 0.1$ Volt
	PH	Power consumption : 450mW , Inrush current : Less than 140mA
Characteristics of Output data		Data
Guarantee		- 2years over - Calibration interval 1years recommended
Operating environment		- Temp. : -10 ~ 50 , 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.

가

→ RL : 100kΩ, Sensor resistance : 400kΩ  
Vout,air : 1.0voltage ( 가 5voltage)

**Toluene, Formaldehyde**



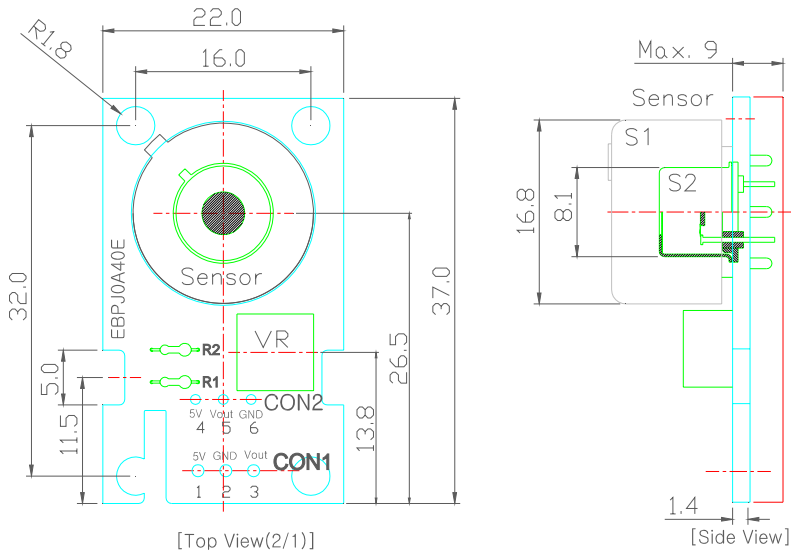
- :  $\pm 15\%$  ( , )  
[ Toluene ] Formaldehyde

ppm	Vout	ppm	Vout	ppm	Vout	ppm	Volt	ppm	Volt
0.0	0.64	1.2	3.13	2.4	3.65	0	1.00	24	1.42
0.1	1.86	1.3	3.19	2.5	3.69	2	1.16	26	1.43
0.2	2.14	1.4	3.24	2.6	3.72	4	1.22	28	1.44
0.3	2.33	1.5	3.29	2.7	3.75	6	1.26	30	1.45
0.4	2.48	1.6	3.34	2.8	3.78	8	1.29	32	1.46
0.5	2.60	1.7	3.38	2.9	3.82	10	1.31	34	1.47
0.6	2.70	1.8	3.42	3.0	3.85	12	1.33	36	1.47
0.7	2.79	1.9	3.47	3.1	3.87	14	1.35	38	1.48
0.8	2.87	2.0	3.51	3.2	3.90	16	1.37	40	1.49
0.9	2.94	2.1	3.54	3.3	3.93	18	1.38	42	1.50
<b>1.0</b>	<b>3.01</b>	2.2	3.58	3.4	3.96	20	1.40	44	1.50
1.1	3.07	2.3	3.62	3.5	3.99	22	1.41	46	1.51

#### c. Sensor connection

- Sensor (Rs) RL ('3.1-b' ) Basic measuring circuit('2 ' )  
( : , )

### d. Structure and Dimensions



### e. Data output (CON1, CON2 )

CON1

CON2

- , → Vcc : 5.0volt
- , → GND
- , → Data(Vout, analogue signal)

### 3.4 Product code & characteristics

Product code	Consumption	Circuit	Output	Worm - up time
GSBT11 – P1XX	390mW	OP - Amplifying	Data : Analogue Relay : Hi(4V), Low(0V)	Long
Study - P2XX		μ - processor	Data : Digital Open collect	short
GSBT11 - P3XX			Data : Analogue	Long

#### 4.

Index	GSBT11	GSBT11-P11X	GSBT11-P21X <sup>study</sup>	GSBT11-P3XX
Circuit	Package	OP - Module	MP - Module	RL - Module
Target Gas	VOCs Gas			
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 3,000ea

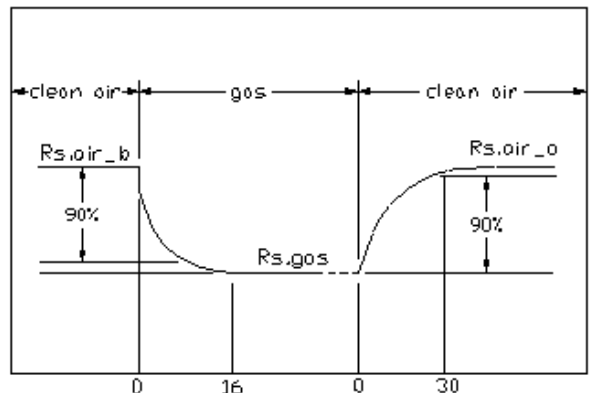
#### 5. Reaction time(T90)

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

GSBT11-P

**1 2 3**

- (1) Division Circuit → 1 : Op-amp circuit 2 : Micro processor Circuit 3:Micro-processor  
 (2) Gas sensing range → **1: Standard**  
 (3) Connector → 0:None

\*

#### summary