

# SM-30

## FIS MEMS Gas Sensor SM-30 For ALCOHOL DETECTION

The SM-30 is a tin dioxide semiconductor gas sensor which has a high sensitivity to alcohol with excellent cross sensitivity. SM-30 uses newly developed MEMS (Micro Electro Mechanical Systems) technology. Compared with conventional bead type sensors (SB-30), only 15% of power, 20mW, is required. Strengths such as short initial action time, quick response, and long life is the most suitable for personal alcohol checkers.

### Structure

Membrane structure is formed at the center of 1.5mm square silicone substrate. Gas sensitive material is formed on the sensor electrodes which are sputtered on the membrane (Fig. 2.) Heater electrode using thin-film platinum is in the insulation membranes. This structure is a bridge formation which increases thermal insulation to the silicon substrate and decreases thermal loss. Chip's electrodes are connected to external terminals by wirebond. (Fig. 1.) The plastic package has twelve holes, 0.3mm in diameter.

### Operating conditions

Fig. 3, 4, and 5 show pin assignment, equivalent circuit, and standard operating circuit, respectively. The specified constant voltage (heater voltage:  $V_H$ ) is applied to the heater to maintain the sensing element at a suitable temperature. The change of the sensor resistance ( $R_S$ ) is obtained as the change of the output voltage across the fixed or variable resistor ( $R_L$ ). In order to obtain the best performance and specified characteristics, the values of the heater voltage ( $V_H$ ), circuit voltage ( $V_C$ ) and load resistance ( $R_L$ ) must be within the range of values given in the standard operating conditions shown in the Specification table on the next page.

### Sensitivity characteristics (typical data)

Sensitivity characteristics of the semiconductor gas sensors are expressed in log-log scale by the relationship between the sensor resistance ( $R_S$ ) and gas concentration (Fig.6.) The sensor resistance decreases with an increase of reducing gas (ethanol, acetone, etc.) concentration. The sensitivity characteristics of the SM-30 is specified by the following parameter.

- Sensor resistance in clean air
- Sensor resistance ratio between 100ppm of ethanol and in clean air.

See the specification table on the next page for further details.

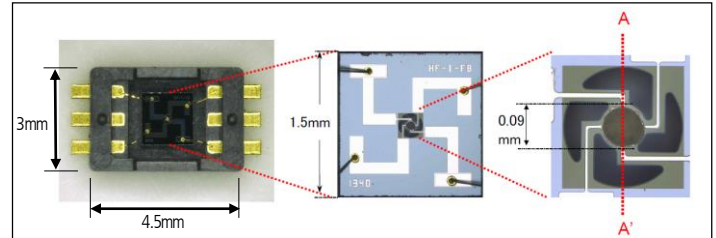


Fig. 1 Structure

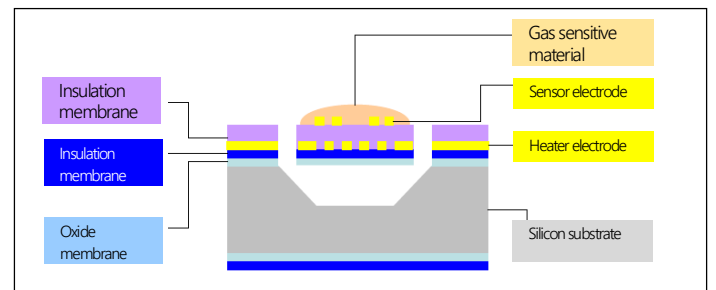


Fig. 2 Sensor cross-section of A-A

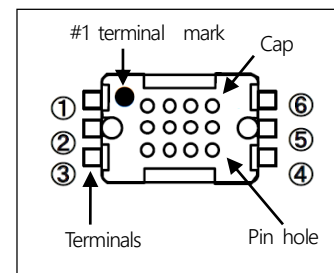


Fig. 3 Pin assignment

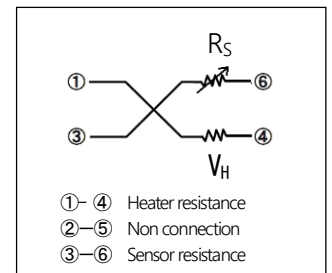


Fig. 4 Equivalent circuit

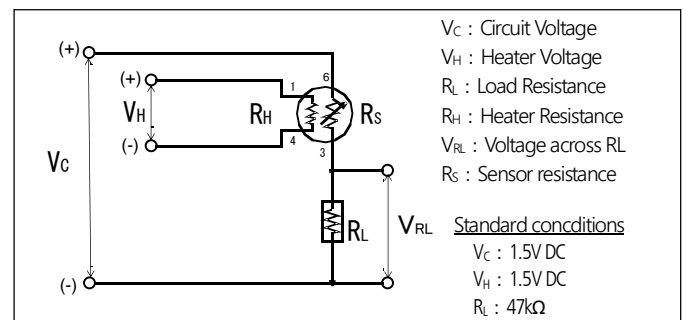


Fig. 5 Standard circuit

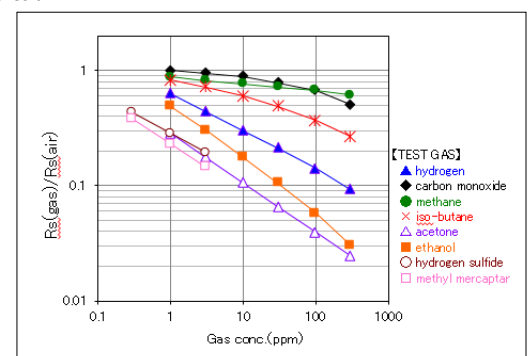


Fig. 6. Sensitivity characteristics

## Specifications

### A. Standard operating conditions

Symbol	Parameter	Specification	Remark
V <sub>H</sub>	Heater voltage	1.5V±4%	DC
V <sub>C</sub>	Circuit voltage	<=1.5V	DC
R <sub>L</sub>	Load resistance	variable	
R <sub>H</sub>	Heater resistance	60Ω (Center)	w/o power
		115Ω (Center)	w/power
I <sub>H</sub>	Heater current	13mA (Center)	
P <sub>H</sub>	Heater power consumption	20mW (Center)	

### B. Environmental conditions

Symbol	Parameter	Specification	Remark
T <sub>ao</sub>	Operating temp	0°C to +40°C	
T <sub>as</sub>	Storage temp	-10°C to +70°C	
RH	Relative humid	Less than 95%RH	No condensation
R <sub>H</sub>	Oxygen conc.	18% to 21%	

### C. Parts and Materials

No.	Parts	Materials
1	Housing	Liquid crystal polymer
2	Sensor chip	Single crystal silicon
3	Cap	Liquid crystal polymer
4	Bonding wire	Gold
5	Terminal	Cu-Ni Au plating

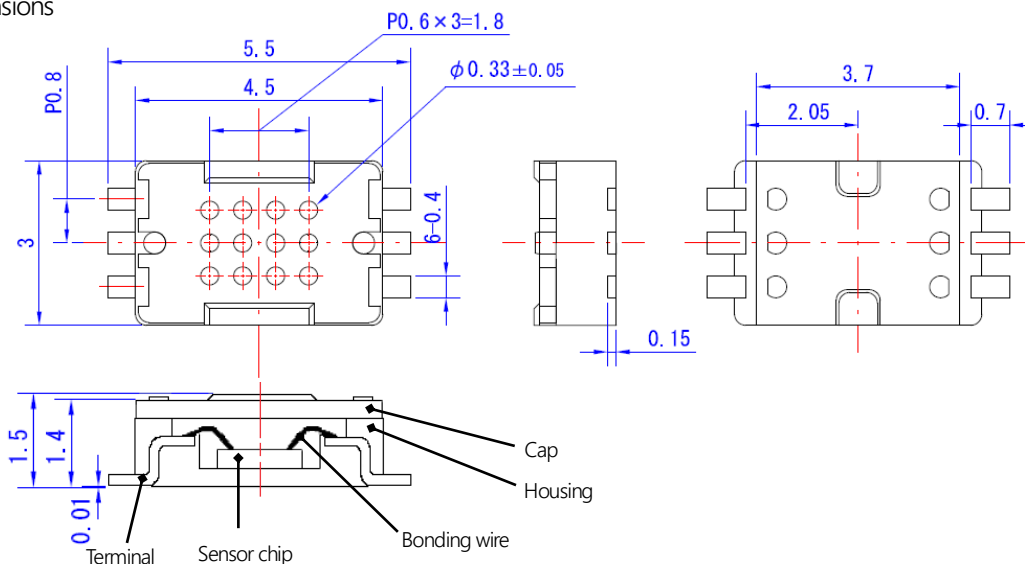
### D. Sensitivity characteristics (SM-30-00)

Symbol	Parameter	Specification	Remark
R <sub>s</sub>	Sensor resistance	800K to 2MΩ	In clean air
B	Sensitivity	Lower than 0.15	Rs in 100ppm EtOH
			Rs in air
<u>Standard test conditions</u>			
Temp : 20°C±2°C		V <sub>C</sub> =1.5V+0/-1%	
R.H. : 65%±5%		V <sub>H</sub> =1.5V±1%	
Pre-heating time : More than 48 hours		R <sub>L</sub> =470KΩ±1%	

### E. Mechanical and electric strength

Items	Conditions	Specifications
Vibration	Frequency	5~500Hz
	Acceleration	1.3G
Shock (drop)	Height	1m
	Surface	Concrete
	Number of drops	3 times
Insulation	Voltage	500V AC
		Insulation resistance : more than 5MΩ
Voltage	Voltage	1000V AC
		Leak current:1mA
Electrostatic discharge	Capacitance	100pF
	Resistance	1.5kΩ
	Voltage	200V
	Time	1sec
	Number of tests	3 times

### Dimensions



In the interest of continued product improvement, we reserve the right to change design features without prior notice.



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