

### EM-FECS(A) - Evaluation Module for FECS-series Sensors

#### Description:

The EM-FECS(A) evaluation module is designed to perform the testing and evaluation of the three-electrode electrochemical gas sensors in the FECS-series. Since the output voltage (V<sub>OUT</sub>) corresponding to the sensitivity characteristics can be obtained, the characteristics of the FECS sensor can be easily evaluated.

#### Operation:

The FECS-series sensor is placed into the sensor socket on the EM-FECS(A). If target gas is present, the output current generated from the FECS-series sensor <sup>(1)</sup> is converted into output voltage. A linear relationship exists between output voltage and target gas concentration. By measuring in advance the output voltage in a known target gas concentration, that gas concentration can be calculated from the measured output voltage values. <sup>(2)</sup>

<sup>1</sup> For more detailed specifications of FECS-series sensors, refer to *Product Information* for each model.

<sup>2</sup> The main function of this module is to simply convert sensor output current into voltage output without temperature compensation.

#### Features:

- \* Converts sensor output current to voltage output
- \* Compatible with all FECS-series sensors
- \* Anti-polarization circuit during power OFF period

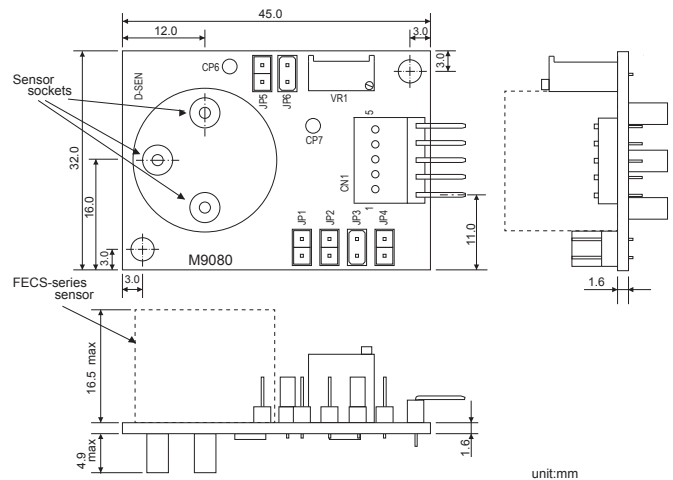


\* Sensor not included

#### Specifications:

Item	Specification
Model No.	EM-FECS(A)
Product name	Evaluation module for FECS-series sensors
Target gases	CO (FECS40-1000) NO (FECS41-250) NO <sub>2</sub> (FECS42-20) SO <sub>2</sub> (FECS43-20) NH <sub>3</sub> (FECS44-100/200/1000/5000) Cl <sub>2</sub> (FECS45-10) H <sub>2</sub> S (FECS50-100)
Input voltage range (V <sub>IN</sub> )	5.0 ± 0.2V DC
Current consumption	<2.0mA
Output voltage (V <sub>OUT</sub> )	- 1.00±0.05V DC in zero air [FECS40-1000, FECS41-250, FECS43-20, FECS50-100, FECS44-100/200/1000/5000] - 3.50±0.05V DC in zero air [FECS42-20, FECS45-10]
Operating conditions	0~60°C, <95%RH (no condensation) For more details of operating conditions, refer to Product Information for each model.

#### Dimensions:

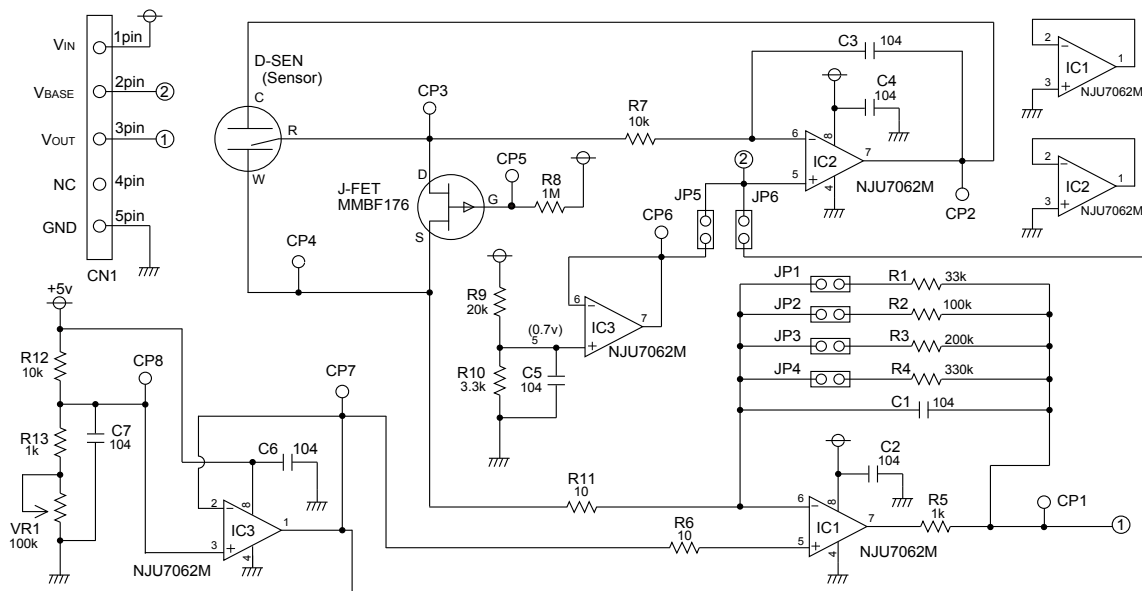


\*FECS-series sensor is to be put in the sensor socket as shown in the above photo.

\*Suggested female connectors mating to the 5-pin connector (JST MB5P-90S):

JST XHP-5P or JST 05JQ-BT

## Schematic Diagram:



### Settings by sensor model (Jumper pin connections and Volume adjustment)<sup>(\*)3</sup>

Sensor Model No.	Amplifying factor for I-V conversion		Bias voltage		Base voltage	Volume adjustment
	Jumper	Factor	Jumper	Value		
FECS40, FECS50	JP1	33,000 x	JP6	-	1.00V	No need
FECS44-5000	JP2	100,000 x	JP6	-	1.00V	No need
FECS43, FECS44-100, FECS-1000	JP3	200,000 x	JP6	-	1.00V	No need
FECS44-200	JP4	330,000 x	JP6	-	1.00V	No need
FECS41	JP1	33,000 x	JP5	+300mV	1.00V	No need
FECS42	JP3	200,000 x	JP6	-	3.50V	Necessary <sup>(*)4</sup>
FECS45	JP4	330,000 x	JP6	-	3.50V	Necessary <sup>(*)4</sup>

<sup>(\*)3</sup> Jumper pins are connected to JP3 and JP6 respectively at time of factory setting.

<sup>(\*)4</sup> Base voltage adjustment method: Please adjust base voltage to 3.5V by VR1 while measuring the voltage value between VBASE (Pin 2) and GND (Pin 5).

### Pin connections:

Pin No.	Name	Description	
1	VIN	Input voltage	5.0±0.2V DC
2	VBASE	Base voltage	1.00V±0.05V at time of factory setting
3	VOUT	Output voltage	
4	-	No connection	
5	GND	Ground	

Sensor output current  $I_s$  ( $\mu\text{A}$ ) is calculated from output voltage  $V_{OUT}$  (V) between Pin #3 (VOUT) and Pin #5 (GND) using the following formula:

$$I_s = ((V_{OUT}[\text{Gas}] - V_{OUT}[\text{Air}]) / \text{I-V conversion amp. factor}) \times 10^6$$

where:  $V_{OUT}[\text{Air}]$ : sensor output voltage in zero air  
 $V_{OUT}[\text{Gas}]$ : sensor output voltage in target gas

**Example:** When output voltage of FECS 50-100 (typical sensitivity of 0.7 $\mu\text{A}$  for H<sub>2</sub>S) are as follows:

$$V_{OUT}[\text{Air}] = 1.00\text{V}$$

$$V_{OUT}[\text{Gas}] = 1.23\text{V}$$

$$I_s = ((1.23 - 1.00) / 33,000) \times 10^6 \approx 7\mu\text{A}$$

\* The calculated  $I_s$  value corresponds to the sensor output in around 10ppm H<sub>2</sub>S.

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#### Caution:

This module is designed for evaluation of the FECS-series sensors only. Please do not use this module for any other purpose.