General

Version 1.0

H2S-SM30-3V series is electrochemical technology based H2S sensor module, which monitors Hydrogen Sulfide gas concentration with compensation over temperature and concentration.

Data sheet for H2S-SM30-3V

Features

- Hydrogen Sulfide gas detectable module with mini-size chemical sensor
- Available outputs : UART, I2C, PWM, Alarm
- Zero-point / Span calibrations are available.
- Compensate over Temperature change effects.
- Easier calibration with Jumper set.
- Battery model (3.0V) is orderable.

- Size : 33mmx33mmx23mm(W.L.H)
- Weight : 9 grams

H2S-SM30-3V Specifications

General Performance

Operating Temperature : -20 ~ 50℃

Operating Humidity : 15 ~ 90% RH (Non-condensing) ('G' option) [1]

Operating Environment : Transformer facility or other Hydrogen Sulfide generation places.

Storage Temperature : 10℃ ~30℃,

H2S Measurement

Sensing Method : Electrochemical type

Reading Range: 0~100 ppm (Maximum overload: 300ppm)

Accuracy : +/-3% .F.S **Resolution: 0.**1ppm **Repeatability:** 2% F.S.

Response Time : T_{90} < 30 seconds **T_{60} < 9** seconds

Zero Drift < 0.2ppm **Span Drift < 2**% signal /month **Lifecycle**: 2 years[2]

Sampling Interval: 1 second

Warming-up Time : < 60 seconds for Accuracy

Electrical Data

Power Input : 3.3VDC (3.2~3.5V) [3] **Current Consumption** < 6.6mA

[1] 'G' : Recommended when used at 80% RH or more humidity environment with coated status to prevent from rust.

[2] Cell chemical should not be depleted by high temperature or continuous, long period exposure.

[3] Battery operation model (2.6~3.0V) could be provided when designated on issuing order.

2mm pitch Board-to-Board with J11&J12 Connectors

J-1	Description
1/3	VDD (+3.3V VCC)
2/4	GND

J-2	Description
1	TTL RXD (← CPU of Master Board)
2	TTL TXD (→ CPU of Master Board)
3	I2C SCL
4	I2C SDA
5	GND
6	Alarm (TTL Signal 0V/VDD Switching)
7	Manual Span Calibration (H2S 100ppm) (1 min.)
8	Reserved
9	Manual Zero Calibration (H2S 0ppm) (1 min.)
10	Reset (Low Active)

UART (J-12:P1&P2) : 38,400BPS, 8bit, No parity, 1 stop bit, 3.3V Level Voltage

I2C (J-12:P3&P4) : Slave mode only, Pull up resister 10kohm is needed on Main-board.

TTL Level Voltage : : $0 \le V_{IL} \le 0.5$, $2.0 \le V_{IH} \le V_{DD}$, $0 \le V_{OL} \le 0.6$, $2.7 \le V_{OH} \le V_{DD}$ (Volt)

PWM (J-13:pin-7 is available) :

t_H = 2 msec (Start) + 300 msec x (Measurement$_{(ppm)}$ / Range$_{(ppm)}$), T_L= 300 ms - t_H

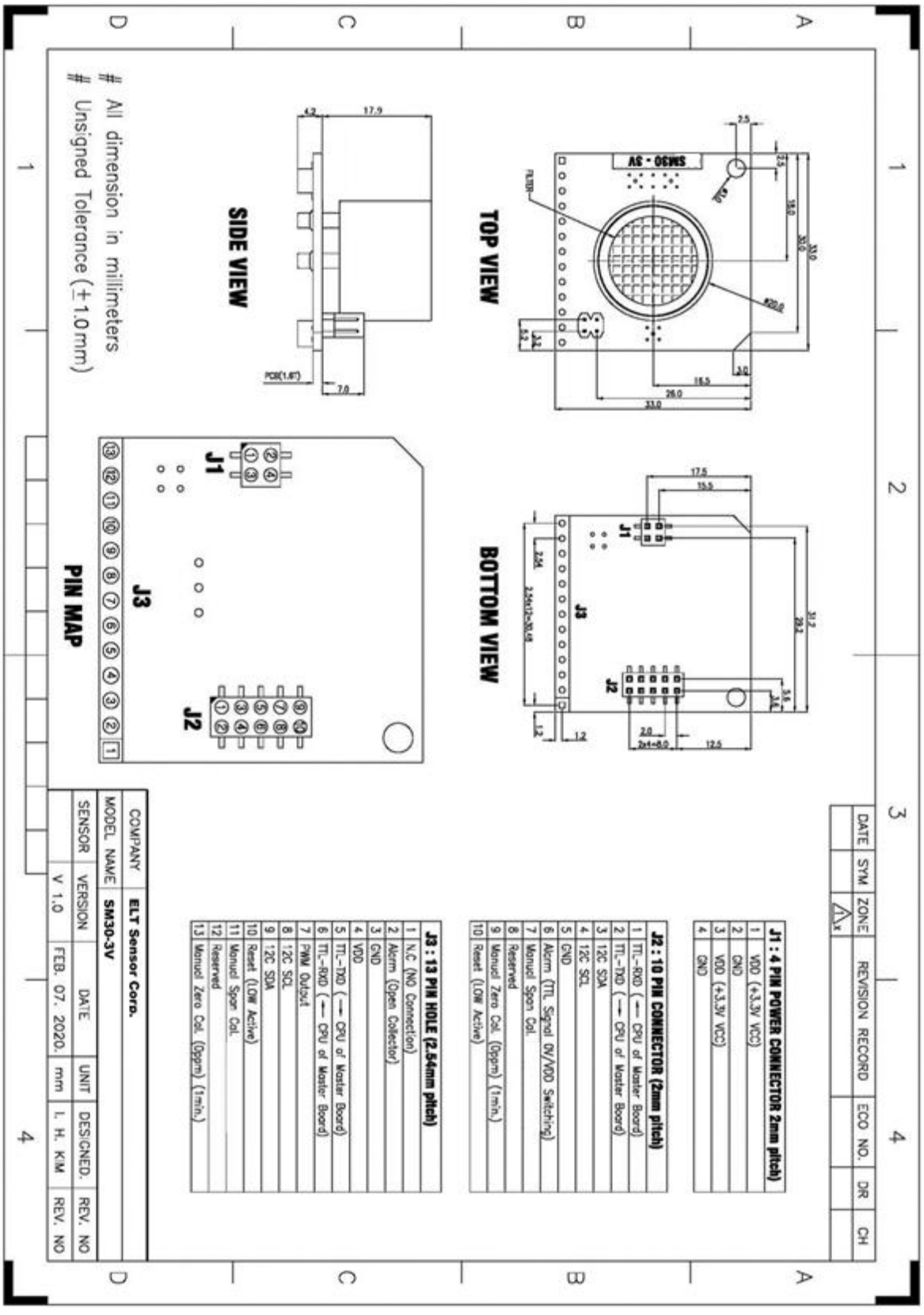
ALARM : Open Collector

2.54mm pitch Side-hole (13 pins) Connectors

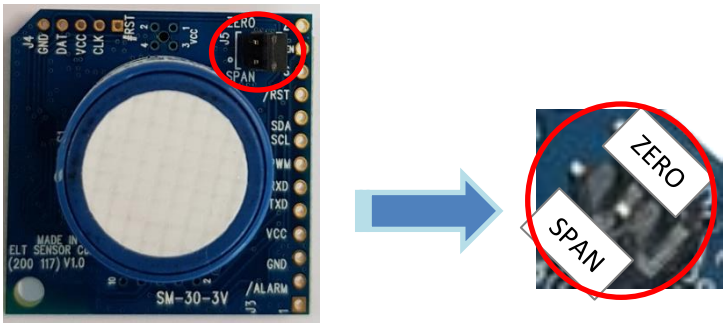
J-3	Description
1	N.C (No Connection)
2	Alarm (Open Collector)
3	GND
4	VDD (+3.3V VCC)
5	TTL TXD (→ CPU of Master Board)
6	TTL RXD (← CPU of Master Board)
7	PWM Output

8	I2C SCL
9	I2C SDA
10	Reset (Low Active)
11	Span Calibration (H2S 100ppm) (1 min.)
12	Reserved
13	Manual Zero Calibration (H2S 0ppm) (1min.)

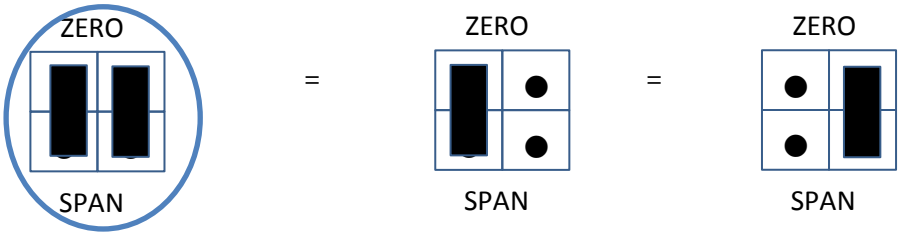
Dimensions (unit : mm)



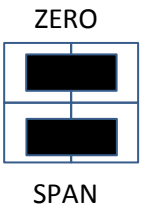
Calibrations vs. Jumper setting



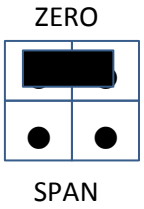
Normal mode-#1 is for mobile-H2S-meter or fixed type H2S-meter installed where H2S gas almost ever-present environment.



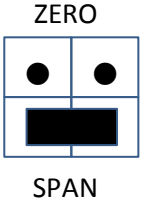
Factory-out status (Default)



Automatic Zero Calibration mode-#2 is for H2S-gas-detector installed in H2S-gas-free area lest unexpected H2S-gas-leakage damages lives in residential buildings, commercial restaurants, lodging, or so.



Manual Zero Calibration mode-#3 is used to calibrate H2S-gas sensors. Please make sure to locate H2S-gas sensors on H2S-gas-free area and move jumper setting from #1 or #2 to #3, which calibrate every minute. After calibration, return to previous set #1 or #2.
(Caution: Please don't use N2 100% gas, nor do other gases which not include O2 gas.)



Manual SPAN Calibration mode-#4 is used to calibrate H2S-gas sensors after #3 cablibration. Please install H2S-sensors on EK-100SL or TRB-100ST and locate in chamber like CMB-10 and calibrate with standard span gas, after zero calibration which calibrate every minute. After calibration, return to previous set #1 or #2.

UART Description

Data Transmit

Interval : 1 seconds

Handshake protocol: None

Data Format

D5	D4	D3	D2	D1	SP	'p'	'p'	'm'	CR	LF

D1 ~ D5	5 byte H2S density string
SP	Space: 0x20
'ppm'	'ppm' string
CR	Carriage return : 0x0D
LF	Line feed : 0x0A

Above 11byte consist by 5 byte hexadecimal digits,<SP>,0x70 0x70 0x6D, <CR><LF> , where decimal '0' (corresponds to hexadecimal digit '0x30') is replaced by space (corresponds to hexadecimal digit '0x20'),

EX) 1000 ppm, results '0x20 0x31 0x30 0x30 0x30 0x20 0x70 0x70 0x6D 0x0D 0x0A', which displays '_1000_ppm<CR><LF>'on screen.

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I2C Communication (Only Slave Mode Operation)

10kΩ pull up resister is on Sensor board.

Slave Address: 0x72, Slave Address Byte: Slave Address(0x72) 7 Bit + R/W 1 Bit

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	1	1	0	0	1	0	R/W Bit

R/W Bit : Read = 1/Write = 0

Slave Address is 0xE5 on reading the data, whereas 0xE4 on writing the data.

Transmission Sequence in Master

1) I2C Start Condition

2) Write Command(Slave Address + R/W Bit(0) = 0xE4) Transmission and Check Acknowledge
3).Write Command(ASCII 'R' : 0x52) Transmission and Check Acknowledge
4) I2C Stop Command
5) I2C Start Command
6) Read Command(Slave Address + R/W Bit(1) = 0xE5) Transmission and Check Acknowledge
7) Read 7 Byte Receiving Data from Module and Send Acknowledge
(Delay at least 1ms for reading each byte)

Configuration	H2S	reserved	reserved	reserved	reserved
1 Byte	2 Byte	0x00	0x03	0x00	0x01

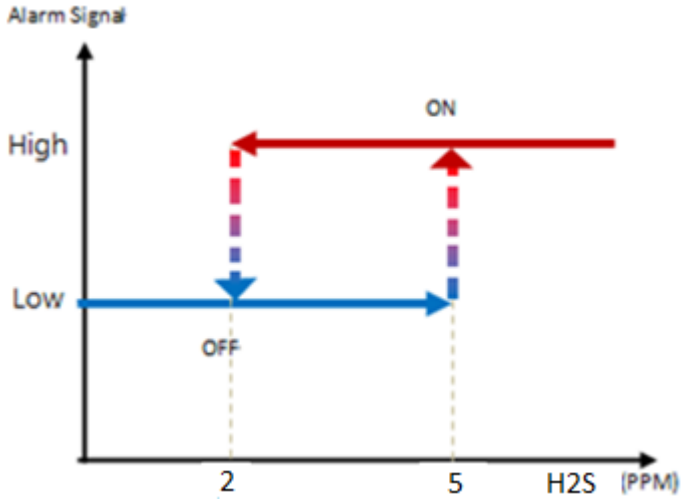
0	0	0	0	1	0	0	0

In need of detail protocol specification and time sequence, **'I2C programming guide'** could be provided by contacting Sales Rep.

Alarm Descriptions

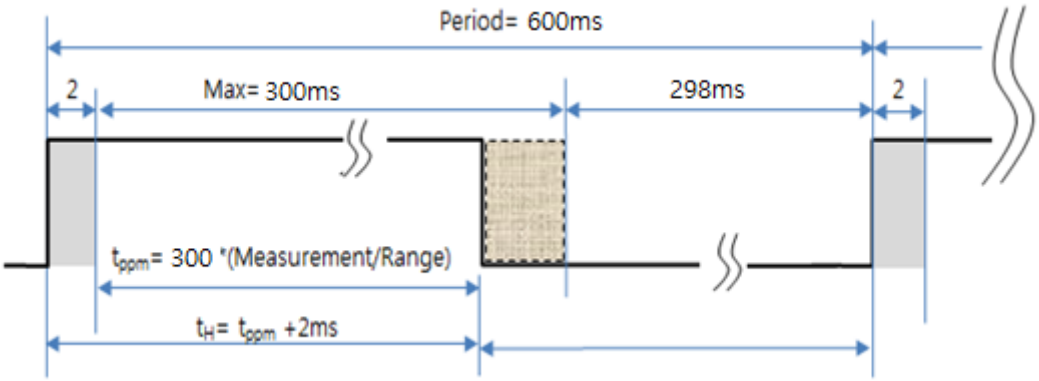
Alarm signal operates as Open Collector type and send TTL on signal since H2S measured value beyond 5 ppm until it go down 2 ppm. To use alarm of sensor, the its ON / OFF points should be designated on issuing order.

5 ppm ≤ Alarm ON, 2 ppm ≥ Alarm OFF



PWM Descriptions ; Option

* Measurement$_{(ppm)}$ = (t_H-2msec)/300msec x Range$_{(ppm)}$ (t_H : High Pulse Width)
* Range$_{(ppm)}$: 100 ppm



EX) t_H (High Pulse Width) calculation for 50 ppm in 100 ppm Reading Range.
*Measurement$_{(ppm)}$ = 50 ppm = (t_H-2ms)/300msec x Range$_{(ppm)}$,
*t_H= 300 msec * (50 ppm / 100 ppm) + 2msec = 152msec
(cf: T_L= Period - t_H = 600 ppm – 152 msec = 448 msec.)

Cautions on Installation

I. The sensor has 2 years' life cycle when stored at 0~20℃, not exceeding 3 months storage
II. The chemical part of Sensor module should not be held; Its PCB part can be be held instead.
III. Soldering time and heat shouldn't exceed 3 seconds and 350℃.
IV. The sensor should be mounted close to the potential leak source at low position to detect H2S gas which is heavier than air. (specific gravity : 1.19 heavier than air).
V. For optimum personnel protection, mounting sensor in the "breathing zone" (5 feet above floor) is recommended.
VI. The sensor should be prevented from water or oil or solvent, or high concentration organic gas existence or continuous vibration, or impulse from outside to avoid damage by them
VII. Power should be inserted into right pins because sensors could be damaged when wired into output pins.
VIII. Please make sure to hold PCB of Chemical-Sensor-module and plug/unplug sensor-module into/from main-board little by little left and right in turn. Too harsh force may break 4-pins and 10pins connectors.
IX. Please install or keep sensors at the place far from electro-static or induced electro-magnetic field effect.
X. Please use air-based standard gas to avoid wrong measurement on checking Sensor performance.

XI. Please be always careful not to inhale toxic H2S gas on calibrating with standard gas.

XII. The sensors components should not be departed or replaced, or manipulated unless request or agree by vendor, Please don't touch electrolyte leaked from sensor when it is damaged or broken. Please make sure to wash out skins with running water when wet by leaked electrolyte.

XIII. Manual-Zero-Calibration is recommended when sensor keeps showing untoward high output at clear air unless sensor is warming up.

Concentration (ppm)	Symptoms/Effects
0.00011-0.00033	Typical background concentrations
0.01-1.5	Odor threshold (when rotten egg smell is first noticeable to some). Odor becomes more offensive at 3-5 ppm. Above 30 ppm, odor described as sweet or sickeningly sweet.
2-5	Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
20	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness.
50-100	Slight conjunctivitis ("gas eye") and respiratory tract irritation after 1 hour. May cause digestive upset and loss of appetite.
100	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours. Death may occur after 48 hours.
100-150	Loss of smell (olfactory fatigue or paralysis).
200-300	Marked conjunctivitis and respiratory tract irritation after 1 hour. Pulmonary edema may occur from prolonged exposure.

Concentration (ppm)	Symptoms/Effects
500-700	Staggering, collapse in 5 minutes. Serious damage to the eyes in 30 minutes. Death after 30-60 minutes.
700-1000	Rapid unconsciousness, "knockdown" or immediate collapse within 1 to 2 breaths, breathing stops, death within minutes.
1000-2000	Nearly instant death

Revision History

Version	Feature	Date
1.0	Release	APR. 2022

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