

## General

Version 1.0

C2H4-SM30-3V series is electrochemical technology based C2H4 sensor module, which monitor ethylene gas concentration and control the fruit ripeness or so.

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# ELT Sensor Data Sheet for C2H4-S20-3V



## Features

- Electrochemical technology used to measure C2H4 gas levels.
- Available outputs : UART, I2C, PWM, Alarm
- Zero and Span Calibration are available
- Compensate over Temperature change effect
- Jumper for Auto/Manual Calibration is available

- Size : 33mmx33mmx23mm
- Weight : 9 grams

## C2H4-SM30-3V Specifications

### General Performance

**Operating Temperature** : -40 ~ 50°C

**Operating Humidity** : 15 ~ 90% RH (Non-condensing) ('G' option) <sup>1</sup>

**Operating Environment** : CA storage, Fresh fruit Ripening, Potable gas detectors or alarms at chemical process factories or storages.

**Storage Temperature** : 5°C ~20°C, **Storage Life** : 6 months in container

**Expected Operation Life** : 2 years in air

### C2H4 Measurement

**Sensing Method** : Electrochemical type

Reading Range: 0~10 ppm, 0~100 ppm, 0~1000 ppm.<sup>2</sup>

**Accuracy** : < +/-3% .F.S                      **Resolution**: 1% F.S.

**Response Time** : T<sub>90</sub> < 90 seconds T<sub>60</sub> < 60 seconds

**Zero drift** : 10 ppm,      **Span drift** : 5% F.S./year

**Sampling Interval**: 1 second

**Warming-up Time** : < 120 seconds

### Electrical Data

**Power Input** : 3.3VDC (3.2~3.5V) <sup>3</sup>

**Current Consumption** < 6.6 mA

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

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

<sup>1</sup> 'G' : Recommended when used at 80% RH or more humidity environment with coated status to prevent from rust.

<sup>2</sup> 0~10ppm is to monitor on getting rid of C2H4 gas on storage , 0~100ppm is on inserting gas to keep constant concentration for faster ripeness of fresh fruit like Avocado, Kiwi, Papaya. 0~1000ppm do same for banana.

<sup>3</sup> Battery operation model (2.6~3.0V) could be provided when designated on issuing order.

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 (C2H4 50ppm) (1 min.)
8	Reserved
9	Manual Zero Calibration (C2H4 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 resistor 10kohm is needed on Main-board.

TTL Level Voltage : :  $0 \leq V_{IL} \leq 0.6$ ,  $1.5 \leq V_{IH} \leq V_{DD}$ ,  $0 \leq V_{OL} \leq 0.6$ ,  $2.7 \leq V_{OH} \leq V_{DD}$  (Volt)

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

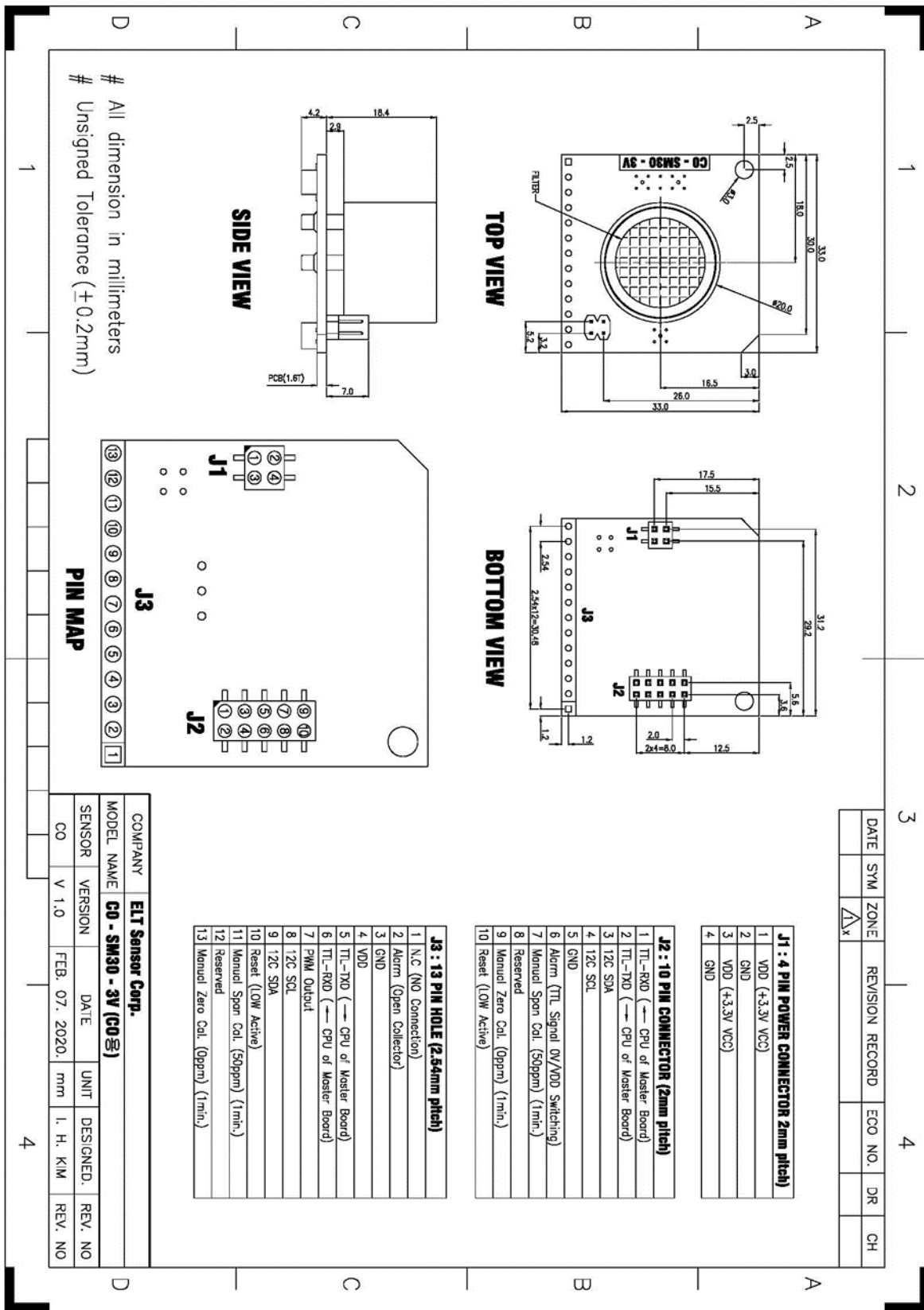
$$t_H = 2 \text{ msec (Start) } + 600 \text{ msec} \times (\text{Measurement}_{(\text{ppm})} / \text{Range}_{(\text{ppm})}), T_L = 600 \text{ ms} - t_H$$

**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 (C2H4 50ppm) (1 min.)
12	Reserved
13	Manual Zero Calibration (C2H4 0ppm) (1min.)

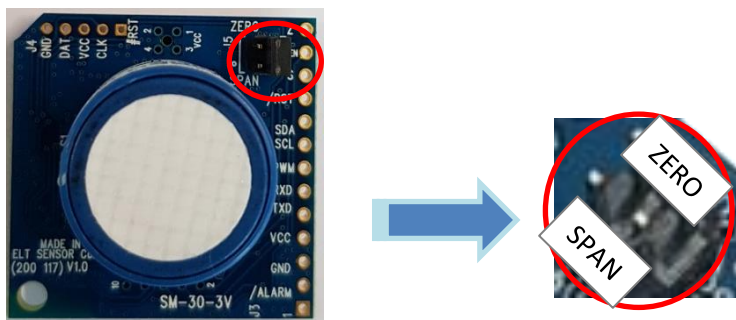
Dimensions (unit : mm)



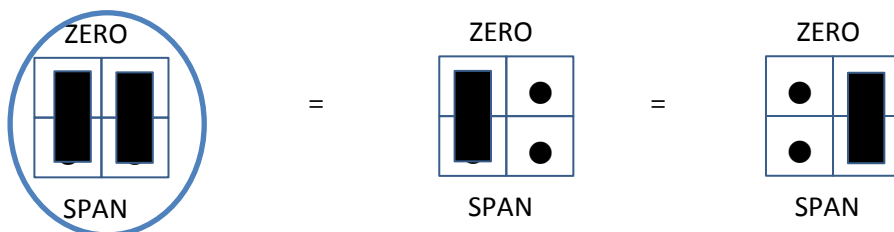
DATE	SYM	ZONE	REVISION RECORD	ECO NO.	DR	CH

COMPANY	ELT Sensor Corp.					
MODEL NAME	C0 - SM30 - 3V (C0용)					
SENSOR VERSION	DATE	UNIT	DESIGNED.	REV. NO		
CO	V 1.0	FEB. 07. 2020.	mm	I. H. KIM	REV. NO	

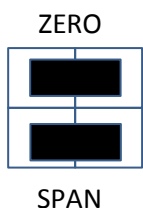
Jumper setting



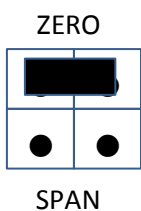
Normal mode-#1 is for mobile-C2H4-meter or and fixed type C2H4-meter installed where always 0.5ppm C2H4 gas existing environment like basement parking Lot, Construction site, confined worksites or so.



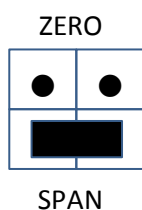
Factory-out status (Default)



Automatic Zero Calibration mode-#2 is for C2H4-gas-detector installed in C2H4-gas-free area lest unexpected C2H4-gas-leakage damages lives in residential buildings, commercial restaurants, lodging, or so.



Manual Zero Calibration mode-#3 is used to calibrate C2H4-gas sensors. Please make sure to locate C2H4-gas sensors on C2H4-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(50ppm) Calibration mode-#4 is used to calibrate C2H4-gas sensors after #3 cablibration. Please install C2H4-sensors on EK-100SL or TRB-100ST and locate in chamber like CMB-10 and calibrate with standard 5ppm C2H4 gas which calibrate every minute. After calibration, return to previous set #1 or #2.

Ethylene Sensor Name	Zero, Span Calibration Concentration	Calibration Time	Recommended Cal. Period
C2H4-SM30-3V-10 (0~ 5ppm)	0, 5 ppm	1 min.	1 year
C2H4-SM30-3V-100 (0~ 100ppm)	0, 50 ppm	1 min.	1 year
C2H4-SM30-3V-1000 (0~ 1000ppm)	0, 500ppm	1 min.	1 year

### UART Description

Data Transmit

Interval : 1 seconds

Handshake protocol: None

Data Format

D5	D4	D3	D2	D1	SP	'p'	'p'	'm'	CR	LF
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D1 ~ D5	5 byte C2H4 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) 5 ppm, results '0x20 0x20 0x20 0x20 0x35 0x20 0x70 0x70 0x6D 0x0D 0x0A', which displays ' \_\_\_5\_ppm<CR><LF>' on screen.

### I2C Communication (Only Slave Mode Operation)

10kΩ pull up resistor is on Sensor board.

Slave Address: 0x75, Slave Address Byte: Slave Address(0x75) 7 Bit + R/W 1 Bit

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

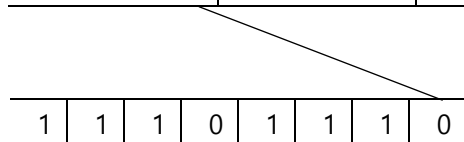
R/W Bit : Read = 1/Write = 0

When reading the data, Slave Address Byte is 0xEF, When writing the data, Slave Address Byte is 0xEE.

**Transmission Sequence in Master**

- 1) I2C Start Condition
- 2) Write Command(Slave Address + R/W Bit(0) = 0xEE) 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) = 0xEF) Transmission and Check Acknowledge
- 7) Read 7 Byte Receiving Data from Module and Send Acknowledge  
(Delay at least 1ms for reading each byte)

Configuration	C2H4	reserved	reserved	reserved	reserved
1 Byte	2 Byte	0x00	0x03	0x00	0x01

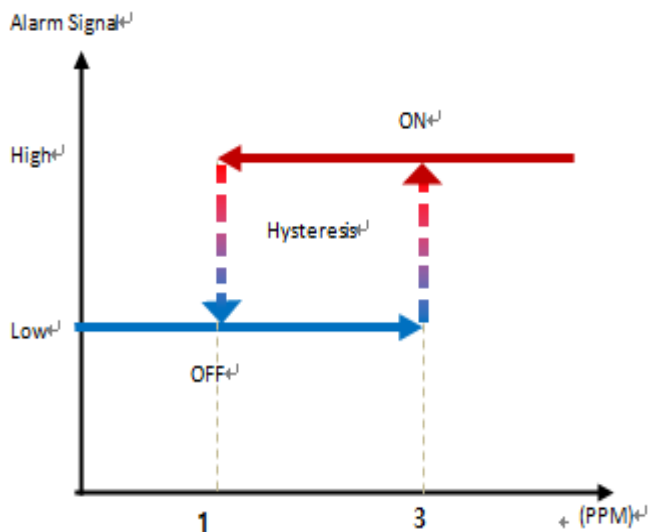


In need of detail protocol specification and time sequence, 'I2C programming guide' could be provided by contacting Sales Rep.

**Alarm Descriptions**

Alarm signal operates as Open Collector type and send TTL on signal since C2H4 measured value beyond 3 ppm until it go down to 1 ppm. It is designed to be activated when C2H4 measured value surpass 3 ppm and deactivated down to 1 ppm to avoid unwanted rapid switching by hysteresis effect.

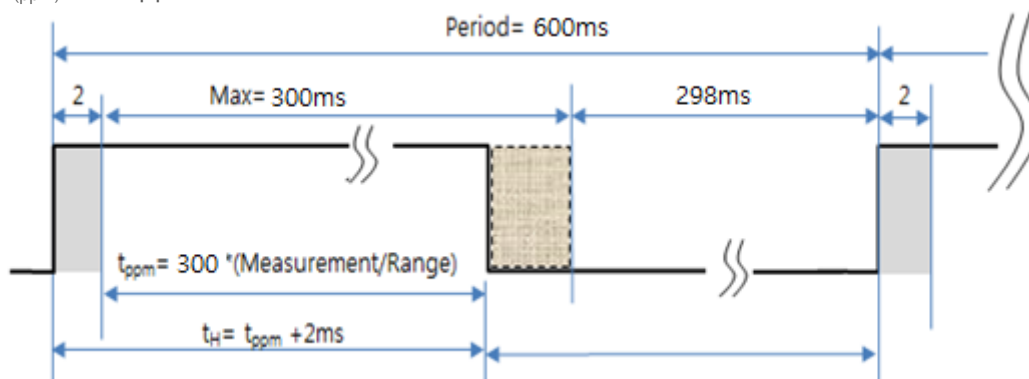
$$3 \text{ ppm} \leq \text{Alarm ON}, 1 \text{ ppm} \geq \text{Alarm OFF}$$



**PWM Descriptions ; Option**

\*  $Measurement_{(ppm)} = (t_H - 2msec) / 300msec \times Range_{(ppm)}$  ( $t_H$  : High Pulse Width)

\*  $Range_{(ppm)} : 600 ppm$



EX)  $t_H$  (High Pulse Width) calculation for 5 ppm in 10 ppm Reading Range.

\*  $Measurement_{(ppm)} = 5 ppm = (t_H - 2ms) / 300msec \times Range_{(ppm)}$  ,

\*  $t_H = 300 msec * (5 ppm / 10 ppm) + 2msec = 152msec$

(cf:  $T_L = Period - t_H = 600 ppm - 152 msec = 448 msec.$ )

**Cautions on Installation**

- I. The sensor has 2 lify cycle when stored at 0~20°C, not exceeding 6 months storage
- II. The chemical part of Sensor module should not be held; Its PCB part can be held instead.
- III. Soldering time and heat shouldn't exceed 3 seconds and 350°C.
- IV. The sensor should be installed at bottom to detect C2H4 gas which is heavier than air.  
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
- V. Power should be inserted into right pins because sensor could be damaged when wired into



output pins.

- VI. 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.
- VII. Please install or keep sensors at the places, far from electro-static or induced electro-magnetic field effect.
- VIII. Please test with air-based standard gas when check Sensor performance.
- IX. 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.
- X. Do Manual-Zero-Calibration when sensor gives 0.5ppm or higher values at clear air.

Revision History

Version	Feature	Date
1.0	Release	2020.AUG

ELT SENSOR Corp.  
 Chunui Technopark 101-909) 36, Bucheon-ro  
 198beon-gil, Wonmi-gu, Bucheon-si, Gyeonggi-do,  
 420-857, Korea  
 phone: +82-32-719-8055, <http://www.eltsensor.co.kr>

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