General

C2H4-LF-3V is NDIR type dual channel ethylene sensor flow-through type module. Its consistent stability and Temperature Effect Resistance are much favored on monitoring ethylene gas concentration to control fruit storing and transportation. C2H4-LF-3V could save power consumption using 3.3Voltage input .

ELT Sensor
Data Sheet for C2H4-LF-3V

Features

• Non-Dispersive Infrared (NDIR) Dual Channel

 Technology to measure C2H4 levels.

• Excellent compensation of Temperature Effect

 on C2H4 concentration.

• Output : TTL-UART, I2C,

 Analog Voltage is optional.

• Easy Calibration with Non-Periodic Manual

 Calibration (0_MCDL : CAL1) and Periodic

 Automatic Calibration (0_ACDL : CAL2).

• Size : 40mmx38mmx18.5mm

• Weight : 20 grams

Specifications

Applications

C2H4-LF-3V sensor modules monitor and control ripeness of plants growing, storing and transport of bananas or other fruit, etc.

General Performance

Operating Temperature : -20 ~ 50℃

Operating Humidity : 0 ~ 95% RH (Non-condensing), 'G : 0 ~ 99% RH (Non-condensing) [1]

Storage Temperature : -30℃ ~70℃

Measurement

Sensing Method : NDIR (Non-dispersive Infrared)

Measurement Range : 0~2,000ppm (0~27,000 ppm is option)

Accuracy : ±3% of F.S. [1],[2],[3],[4]

Output unit: ppm output is default, LEL % is optional

Resolution: 50ppm

Lowest Detection Limit: 100ppm @25℃

Step Response Time (90%, 1/e) : 30 seconds / 20 seconds

Sampling Interval: 3 seconds

Warming-up Time : < 6 seconds (for Detection), 2 minutes (for Accuracy)

Electrical Data

Power Input : 5V ± 5% (5)

Current Consumption : Normal mode : 14mA, Peak : 270mA

Product Derivatives and Relative Functions

Products	Feature	5V Option
C2H4-LF-3V	Flow-thru type of C2H4-LD-3V, open two holes on side and disable the white colored filter on the top of Gold Cavity.	C2H4-LF
C2H4-LFG-3V	Enable sensor to operate in very humid environment up to 99 %RH humidity, protecting PCB from rustiness.	C2H4-LFG

C2H4-LD-3V has various output TTL-UART, I2C while as Analog voltage is selectable as option.

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[1] C2H4-LFG-3V: 0 ~ 99% RH (Non-condensing) for Industrial Application of Ethylene gas.
[2] 2% should be added for absolute measurements for uncertainty of calibration gas mixture unless '0' ppm or '0'ppm standard gas calibration is done.
[3] Air pressure is assumed as 101.3 kPa.
[4] If sensor is affected by the shock, may need field calibration before installation.
[5] DC Supply should be regulated without ripple < 100mV, low noise power source is needed for best accuracy.

Pin Map with J11&J12 Connectors

J-11	Description
1/3	V_{DD} (+3.3VDC)
2/4	GND

J-12	C2H4-LF-3V	C2H4-LF-3V (Analog Voltage Option)
1	TTL RXD (← CPU of Master Board)	
2	TTL TXD (→ CPU of Master Board)	
3	I2C SCL	
4	I2C SDA	
5	GND	
6	Reserved	Analog Voltage Output (0.5~3V)
7	CAL2-pin : 0_ACDL (for every 7 days ACDL with periodic C02-'0'ppm circumstance)	
8	Reserved	
9	CAL1-pin : 0_MCDL (for 2 minutes MCDL with C2H4-'0'ppm- N2-based-gas or Fresh Air)	
10	Reset (Low Active)	

UART 38,400BPS, 8bit, No parity, 1 stop bit
9,600 or 19,200 BPS can selectable through command sets or EK-100SL.

I2C Slave mode only, Internal pull up resister 10kΩ

TTL Level Voltage : $0≤V_{IL}≤0.4, 2≤V_{IH}≤ V_{DD}, 0≤V_{OL}≤0.4, 2.4≤V_{OH}≤ V_{DD}$ (Volt)

Analog Voltage: 0.5~4.5V (option)

Pin Map with JP-1 jumper selection.

| JP-1	C2H4-LF-3V
1	N (Normal)
2	CAL1 (MCDL)
3	CAL2 (ACDL)

0_MCDL (2 minutes Manual Calibration)

'0' ppm Manual Calibration can be done by locating jumper-cap on JP-1:pin2, another way is giving start command or low signal to CAL1-pin at least more than 2 minutes since the fresh air is fully balanced near sensor.
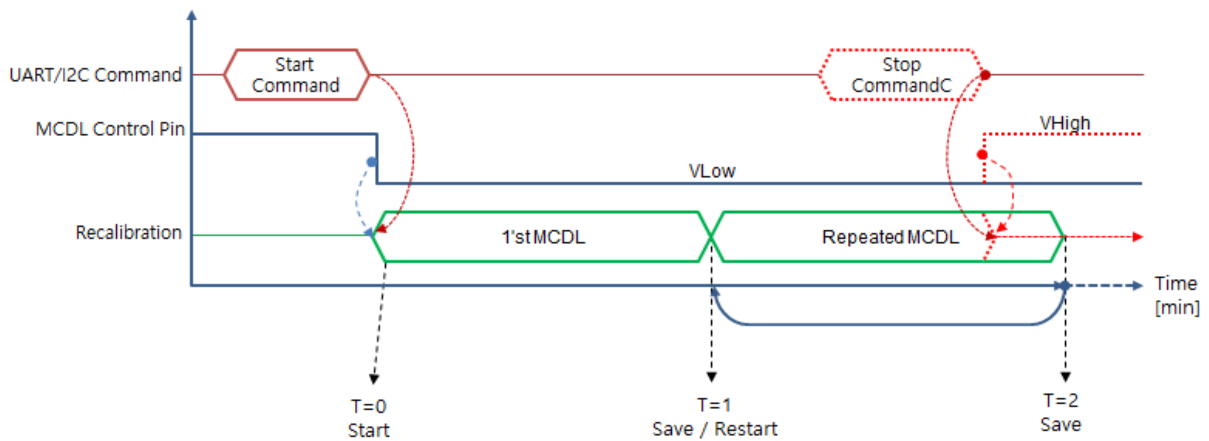
0_ACDL (Periodic Automatic Calibration)

'0' ppm Periodic Automatic Calibration can be done by locating jumper-cap on JP-1:pin2, another way is giving start command or low signal to CAL2-pin. The sensor calibrate once in 1 day and every other day since then. '0'ppm Standard Gas can be used when the place doesn't face free air during the period.
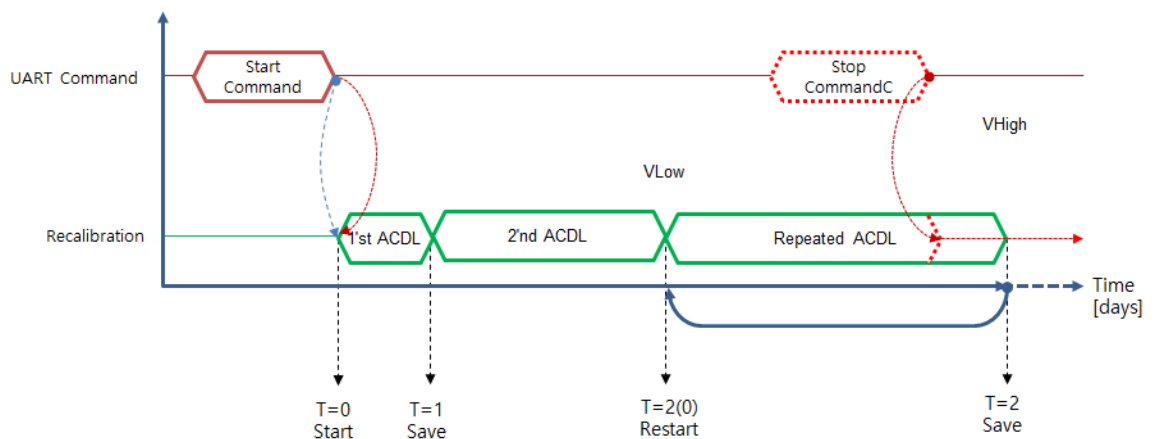
Method 1. UART Command Set;   J12: pin-1 (UART-RX) and pin-2 (UART-TX) to Main-Board   (J13: pin-5 and pin-6 are available as well.).

Method 2. I2C Command Set;   J12: pin-3 (SCL) and pin-4 (SDA) to Main-Board. (J13: pin-8 and pin-9 are available as well.)

Method 3. Let Sensor install on Jig Board, **TRB-100ST (Test and Recalibration Board)** with ambient air-flow condition or with 0'ppm Standard Gas and execute by moving jumper following Manual on the website.

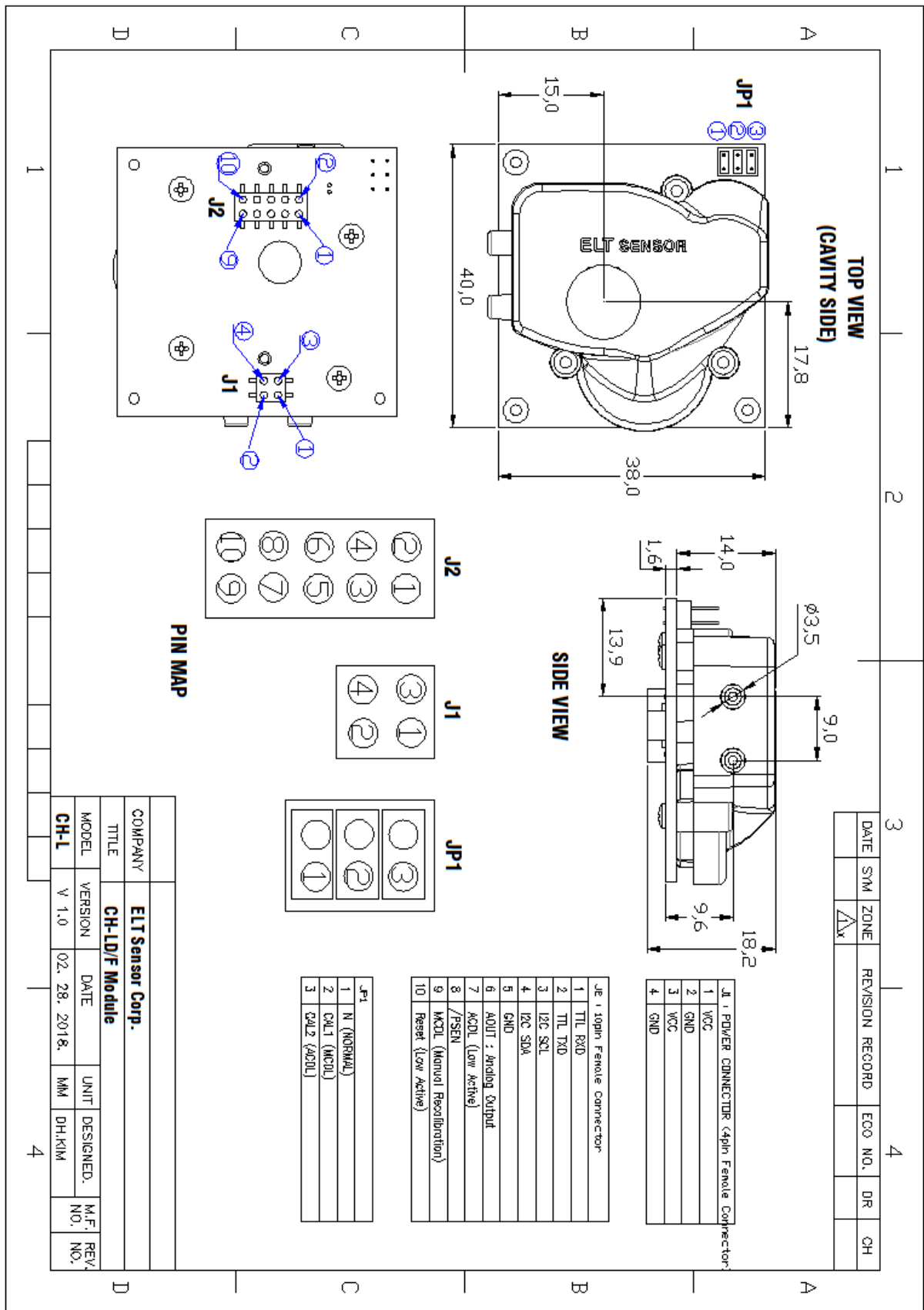Method 4. Send string command set below to RXD-pin of Sensor on Emulation program.
    EK-100SL (Evaluation kit, with Emulation program 'ELTWSD') is available

Method 5. CAL1 / CAL2-pin settings for 0_MCDL / 0_ACLD

CAL1 0_MCDL	CAL 2 0_ ACDL	Function	Process
Low	High	H/W '0'ppm MCDL	Let C2H4-LF-3V sensor be located at ambient place where no Ethylene gas exist and wait 2 minute. '0'ppm Standard gas can be used when '0'ppm is not guaranteed.
High	**Low**	H/W '0' ppm ACDL	Automatic Calibration can be used where C2H4-LF-3V face the clear air more than 3 minutes per week.
High	High	Normal	Operate with Factory Calibrated or previously set status

※ 1. CAL-1pin and CAL-2pin shouldn't have 'Low' at the same time.
    2. Be sure to escape MCDL fetch loop between 2 minutes and 4minutes to avoid
       inappropriate calibration.

Cavity Dimensions (unit : mm)

TOP VIEW (CAVITY SIDE)

15,0
40,0
17,8
38,0

SIDE VIEW

1,6
14,0
13,9
ø3,5
9,0
9,6
18,2

JP1

PIN MAP

J2
J1
JP1

J2 : 10pin Female Connector	
1	TTL RXD
2	TTL TXD
3	I2C SCL
4	I2C SDA
5	GND
6	AOUT : Analog Output
7	ACDL (Low Active)
8	/PSEN
9	MCDL (Manual Recalibration)
10	Reset (Low Active)

J1 : POWER CONNECTOR (4pin Female Connector)	
1	VCC
2	GND
3	VCC
4	GND

JP1	
1	N (NORMAL)
2	CAL1 (MCDL)
3	CAL2 (ACDL)

COMPANY	ELT Sensor Corp.			
TITLE	CH-LD/F Module			
MODEL	CH-L			
VERSION	V 1.0	DATE	02. 28. 2018.	UNIT MM
			DESIGNED.	D.H.KIM

DATE	SYM	ZONE	REVISION RECORD	ECO NO.	DR	CH

Output Descriptions
UART Descriptions

Data Format

Above 12byte consist by 2 byte hexadecimal digits, <SP>,<SP>,<SP>, D2, D1, 0x25, <SP>, 'p', 'p', 'm', <CR><LF> , where decimal '0' (corresponds to hexadecimal digit '0x30') is replaced by space (corresponds to hexadecimal digit '0x20'),

EX) D6~D1 string display the C2H4-LF-3V concentration of

D6	D5	D4	D3	D2	D1	SP	'p'	'p'	'm'	CR	LF
SP x 3							Space: 0x20				
D2 ~ D1							2 byte C2H4 density string				
%							% : 0x25				
SP							Space: 0x20				
'ppm'							' ppm' string				
CR							Carriage return : 0x0D				
LF							Line feed : 0x0A				

EX) 3,500 ppm string is '0x20 0x20 0x33 0x35 0x30 0x30 0x20 0x70 0x70 0x6D 0x0D 0x0A', of which display on the screen is '__3500_ppm<CR><LF>'.

I2C Communication (Only Slave Mode Operation)
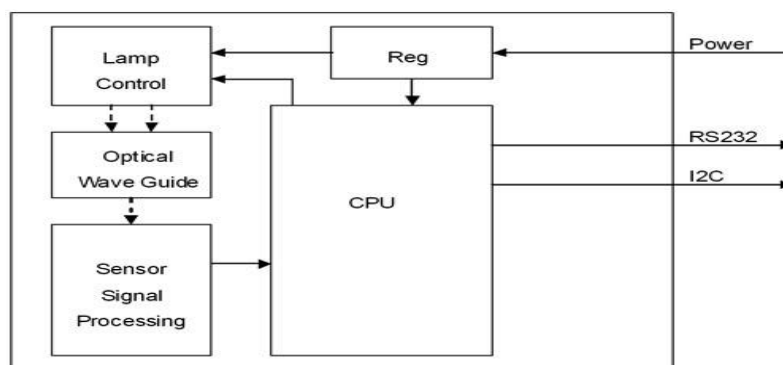
Internal pull up resister 10kΩ

Slave Address: 0x31, Slave Address Byte: Slave Address(0x31) 7 Bit + R/W 1 Bit

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

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

When reading the data, Slave Address Byte is 0x63, When writing the data, Slave Address Byte is 0x62.

Block Diagram

Transmission Sequence in Master

1) I2C Start Condition

2) Write Command(Slave Address + R/W Bit(0) = 0x62) 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) = 0x63) Transmission and Check Acknowledge

7) Read 7 Byte Receiving Data from Module and Send Acknowledge

   (Delay at least 1ms for reading each byte)

Configuration	CO_2	reserved	reserved	Reserved	reserved
1 Byte	2 Byte	0x00	0x00	0x00	0x00

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.

Analog Voltage Output Descriptions : Option

Measured Voltage 0.5V~3V match proportionally to 0 ~ 2,000ppm.

* C2H4 Measurement $_{(ppm)}$ = Output $_{Voltage}$– 0.5$_/$ (3 – 0.5) $_{Voltage}$ x 2,000ppm.

> EX) if the Output $_{Voltage}$ is 2.5V in 0~2,000ppm range,
>   C2H4 (ppm) = (2.5 – 0.5) V÷ (3 – 0.5)V x 2,000ppm
>   =0.8 x 2,000ppm = 1,600ppm

※Caution

1. Please use only 'PCB' of sensor to avoid the physical shock on sensor without holding Gold-Colored-Cavity directly. Rough handling or Transportation could result in inaccurate reading..
   But, 0_MCDL with CAL1 or 0_ACDL with CAL2 are available to correct the sensor to normal status.

2. Proper ESD protection during handling is important to avoid electrostatic defect occurrence like motors and the storage of sensor should be insulated as well.

3. Sensor location should be protected from Vibration as far as possible, which could effect the sensor location

4. Sensor location should be a bit higher 1.5~2m because Ethylene gas has low specific gravity than air.

5. Manual Calibration (MCDL) is recommended when restart Sensor after long period storage or

effected by physical shock or drop. Please make sure to calibrate on operating environment when use higher or lower temperature or humidity than normal.

6. When MCDL was finished, please make sure to let the jumper-cap of JP-1 return to original location like ACDL or None.

7. Automatic Calibration (ACDL) could save management cost when the concentration is 50ppm or lower.