General

CH4-LD-3V is world's lowest concentration detectable small size methane sensor module. Its persistent accuracy and stability through the life cycle, and Temperature Effect Compensation are incomparably favored by industrial field experts carrying various flammable, explosive, and hazard gases.

Version 1.0

CH4-LD-3V

• NDIR Technology to measure methane gas level.

• Excellent compensation of Temperature Effect.

• Output : TTL-UART, I2C

     (Analog Voltage is option)

• Easy Calibration with Non-Periodic Manual

  Calibration (MCDL : CAL1) and Periodic

  Automatic Calibration (ACDL : CAL2).

• Size : 33mmx38mmx18.5mm

• Weight : 17 grams

CH4-LD-3V Specifications

Applications

CH4-LD-3V expands the application category to even Homes and Offices as well as industrial gas dealing factories as Gas leakage alarming detector for Methane, LNG or combustible gases in Mine, metallurgy, liquefied gas station, petroleum, fuel gas ,etc.

General Performance

Operating Temperature : -20 ~ 50℃

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

Storage Temperature : -30℃ ~70℃

CO_2 Measurement

Sensing Method : NDIR (Non-dispersive Infrared)

Output unit : 'ppm' as default ('LEL %' is optional)

Measurement Range : 0~5,000ppm(0~10% LEL) is default , 0~50,000ppm(0~100% LEL) is optional.

Accuracy : ±3% of F.S. [1],[2],[3]

Detection Resolution : 50ppm default (= 0.1% LEL)

Lowest Detection limit : 50ppm (= 0.1% LEL)

Step Response Time (90%, 1/e) : 120 seconds (90%), 70 seconds (1/e) for Diffusion type

Sampling Interval : 3 seconds

Warming-up Time :   6 seconds (for Detection)

  5 minutes - Diffusion type (for Accuracy)

  1 minutes - Flow Through type (for Accuracy)

Electrical Data

Power Input : 3.2V ~ 3.6V

Current Consumption : Normal mode : 14mA, Peak/Typical : 270mA, [4]

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[1]DC Supply should be regulated without ripple < 100mV, low noise power source is needed for best accuracy

[2] If sensor is affected by the shock, may need field calibration before installation.

[3] Air pressure is assumed as 101.3 kPa..

[4] Current Capacity should 2~3 times of Peak Current.

Product Derivatives and Relative Functions

Products	Feature	5V Derivatives
CH4-LDG-3V	Resistant up to 99% humidity	CH4-LDG
CH4-LF-3V	Flow through type	CH4-LF
CH4-LFG-3V	Resistant up to 99% humidity for Flow through type	CH4-LFG

CH4-LDG-3V and CH4-LFG-3V have 'G' suffix which could resistant to 99% humidity. CH4-LF-3V and CH4-LFG-3V has 'F' option which has two tube inlets for 'Flow Through' instead of white colored filter for 'Diffusion'.

Pin Map with J11&J12 Connectors

J-11	CH4-LD-3V
1/3	VDD (+5VDC)
2/4	GND

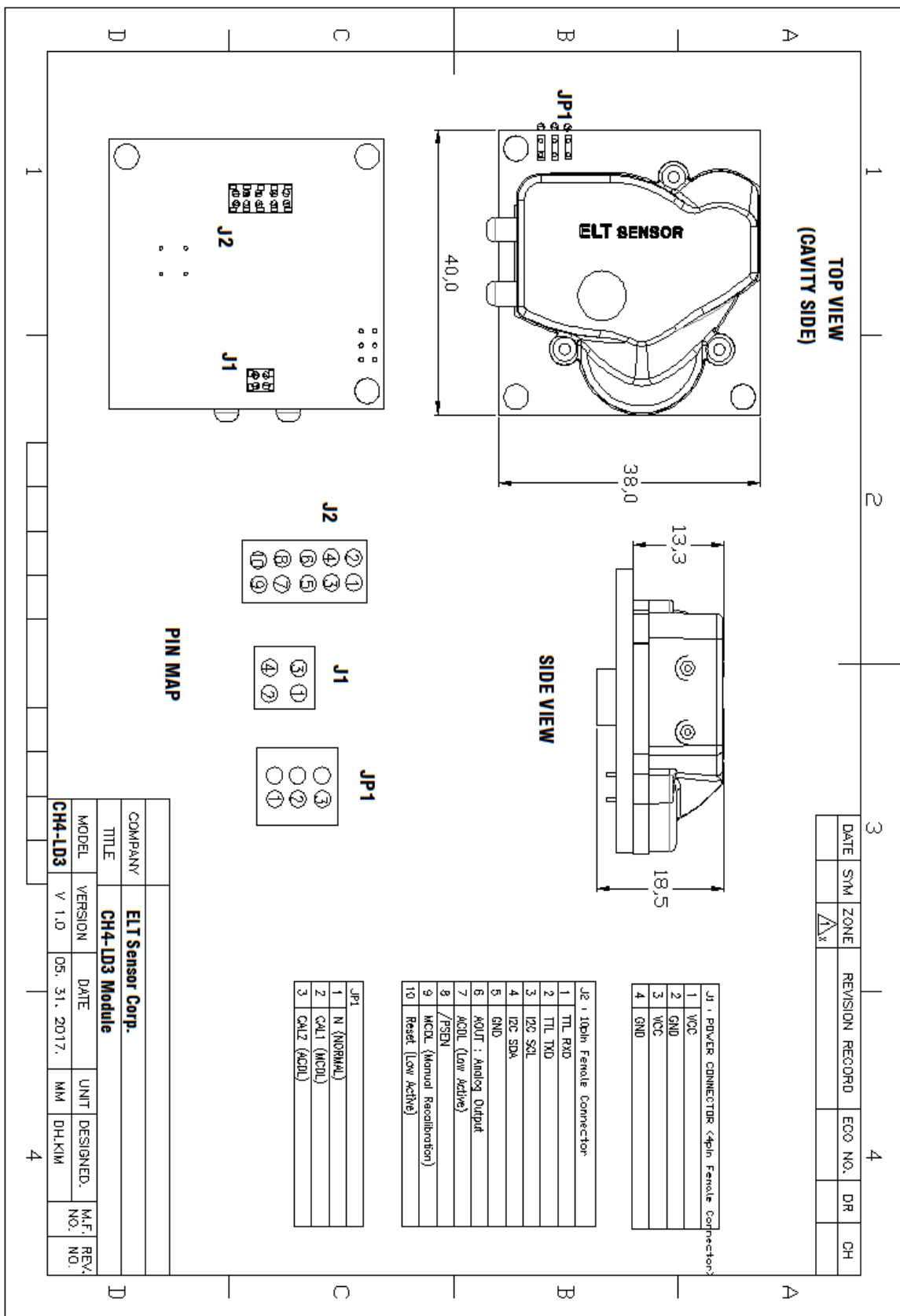| J-12	CH4-LD-3V
1	TTL RXD ($\leftarrow$ CPU of Master Board)
2	TTL TXD ($\rightarrow$ CPU of Master Board)
3	I2C SCL
4	I2C SDA
5	GND
7	CAL2-pin : ACDL (for every 7 days ACDL with periodic CH4-'0'ppm circumstance)
8	Reserved
9	CAL1-pin : MCDL (for 1 minute MCDL with CH4-'0'ppm- CH4-'0'ppm circumstance)
10	Reset (Low Active)

Pin Map with J13 Connectors

JP-1	CH4-LD-3V
1	N (Normal)
2	CAL1 (MCDL)
3	CAL2 (ACDL)

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 : $0 \leq V_{IL} \leq 0.8$, $2 \leq V_{IH} \leq V_{DD}$, $0 \leq V_{OL} \leq 0.4$, $2.4 \leq V_{OH} \leq V_{DD}$ (Volt)

Analog Voltage (option) : 0.5~3.0V

Cavity Dimensions (unit : mm)

TOP VIEW
(CAVITY SIDE)

SIDE VIEW

ELT SENSOR

40.0

38.0

13.3

18.5

PIN MAP

J1

J2

JP1

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

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

JP1	
1	N (NORMAL)
2	CAL1 (MCOL)
3	CAL2 (ACOL)

DATE	SYM	ZONE	REVISION RECORD	ECO NO.	DR	CH

COMPANY	ELT Sensor Corp.				
TITLE	CH4-LD3 Module				
MODEL	CH4-LD3	VERSION	V 1.0	DATE	05. 31. 2017.
		UNIT	MM	DESIGNED.	DH.KIM
				M.F. NO.	REV. NO.

MCDL and ACDL Calibration.

✛ MCDL (1 minutes Manual Calibration)

'0' ppm Manual Calibration can be done by giving start command or low signal to CAL1-pin at least more than 1 minute since the fresh air is fully balanced near sensor.
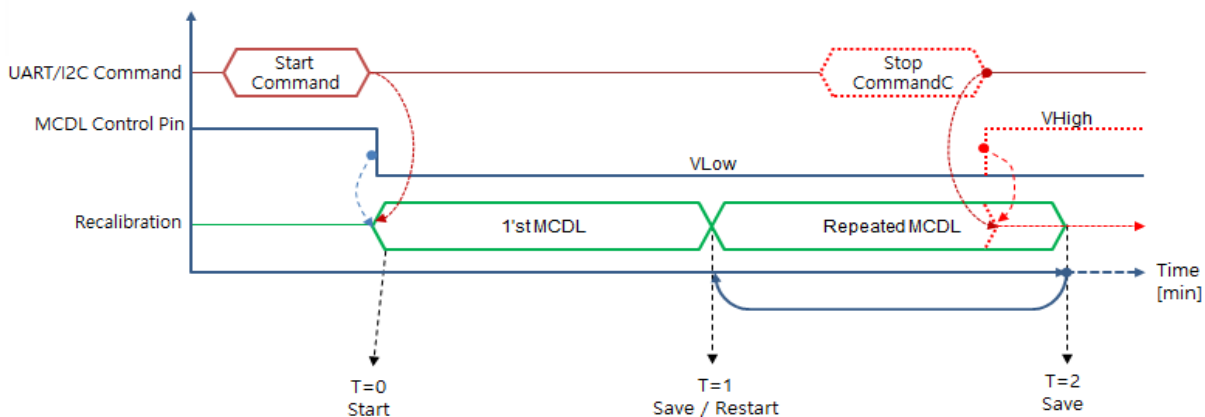
✛ ACDL (Periodic Automatic Calibration)

Periodic Automatic Calibration can be used by giving start command or low signal to CAL2-pin. The sensor calibrate automatically first in 2 days, seconds 5 days and every week.
'0'ppm Standard Gas can be used when the place doesn't face free air during the period.
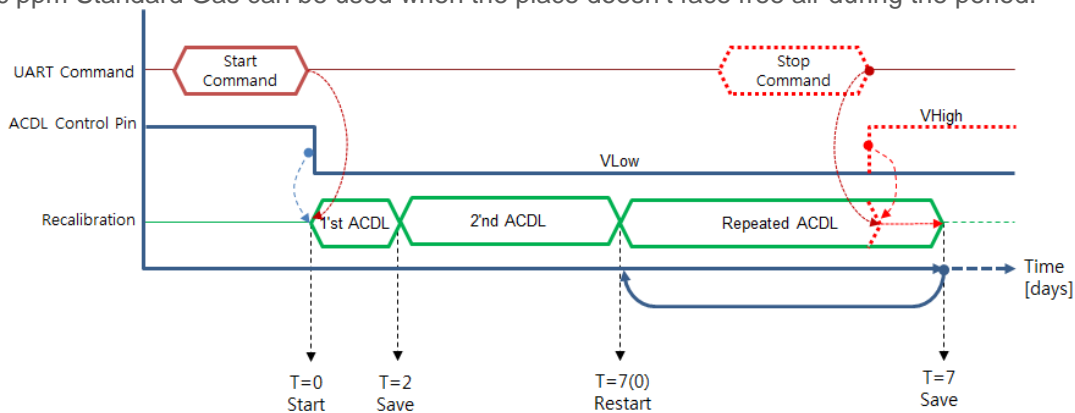
Method 1. Commands set for MCDL or ACDL Calibrations for is available.**EK-100SL (Evaluation kit, with Emulation program 'ELTWSD')** is purchasable for user's convenience.

UART/I2C Command Sets are available at J12 pin-1,2 (RX, TX) / J12 pin-3/4 (SCL,SDA).

Method 2. MCDL/ACDL Control pins are available. **TRB-100ST (Test and Recalibration Board)** JIG-Board at ambient air-flow condition or with 0'ppm Standard Gas and execute by moving jumper following Manual on the website.

CAL1 / CAL2 control pins are available at J12 pin-9/ pin-7 or JP1 pin-2/pin-3

CAL1 MCDL	CAL 2 ACDL	Function	Process
Low	High	H/W MCDL	Let CH4-LD-3V sensor be located at ambient place where no methane gas exist and wait 1 minute. '0'ppm Standard gas can be used when '0'ppm is not guaranteed.
High	**Low**	H/W ACDL	Automatic Calibration can be used where CH4 meet the clear air more than 3 minutes per week.
High	High	Normal	Operate with Factory Calibrated or previously set status

※   CAL-1pin and CAL-2pin shouldn't have 'Low' at the same time.

Output Descriptions

UART Descriptions

Data Format

SP	SP	SP	D2	D1	'%'	SP	'L'	'E'	'L'	CR	LF

SP x 3	Space: 0x20
D2 ~ D1	6 byte CH4 density string
SP	Space: 0x20
'LEL%'	' LEL%' string
CR	Carriage return : 0x0D
LF	Line feed : 0x0A

Above 12byte consist by 6 byte hexadecimal digits, <SP>,<SP>,<SP>,0x70 0x70 0x6D, <CR><LF> , where decimal '0' (corresponds to hexadecimal digit '0x30') is replaced by space (corresponds to hexadecimal digit '0x20'),

EX) 7% LEL (= 3,500 ppm) string is '0x20 0x20 0x20 0x20 0x37 0x25 0x20 0x4C 0x45 0x4C, 0x0D 0x0A',, of which display on the screen is '____7%_LEL<CR><LF>'.

'ppm' display is Option on sale, which D6~D1 string display the CH4 concentration of

D6	D5	D4	D3	D2	D1	SP	'p'	'p'	'm'	CR	LF

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)
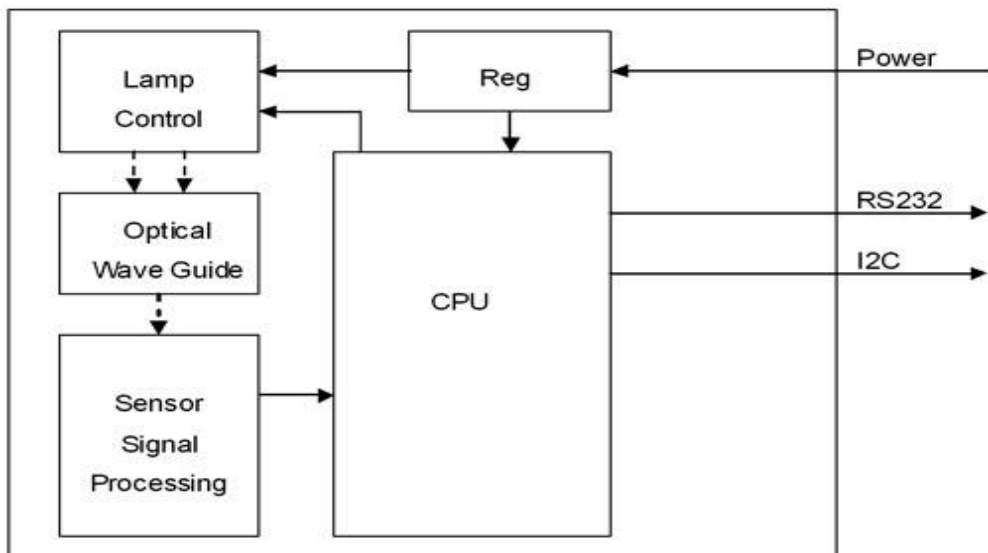
Internal pull up resister 10kΩ

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 : Optional
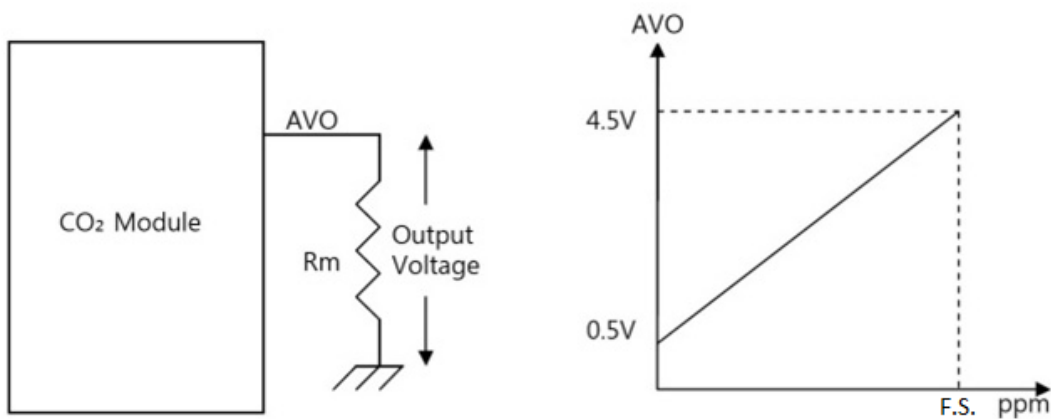
Measured Voltage 0.5V~3.0V match proportionally to 0 ~ 100% LEL.

* CH4 Measurement $_{(ppm)}$ = Output $_{Voltage}$– 0.5$_/$ (3 – 0.5) $_{Voltage}$ x 100% LEL.

  cf. F.S. $_{(ppm)}$: 2,000/3,000/5,000/10,000 ppm (20,000/30,000/50,000/100,000 is optional.)

   EX) if the Output $_{Voltage}$ is 2V in LEL 0~100% range,

   CH4 ppm= (1 – 0.5) V÷ (3 – 0.5)V x 100% LEL

   =1/2.5 x 100% LEL = 25% LEL

※ Caution

1. Please use only 'PCB' of sensor to avoid the physical shock on sensor without holding 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. The
   storage of sensor should be insulated as well

※ Specification of C-H Series could be changed without notice.