General

CH4-LF-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

Data Sheet for CH4-LF-3V

Methane Sensor Module

Features

- Non-Dispersive Infrared (NDIR) Dual Channel
- 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 : 40mmx38mmx18.5mm
  - -Gas Gap : 3.5mm (Φ)
  - -Tube (Soft Teflon Tube) : 2.5~3mm (Φ)
- Weight : 17 grams

CH4-LF-3V Specifications

Applications

CH4-LF-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℃

CH4 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.
0~2,000/10,000/50,000ppm (0~100% LEL) is optional.

Accuracy : ±3% of F.S. (1),(2),(3)

Detection Resolution : 50ppm default

Step Response Time (90%, 1/e) : 15 seconds (90%), 10 seconds (1/e)

Sampling Interval : 3 seconds

Warming-up Time : 6 seconds (for Detection), 1 minute (for Accuracy)

Gas flow rate in Optical Waveguide : 50cc~150cc (50~150 ml/min.)

Electrical Data

Power Input : DC 3.3V **(**3.2~3.6V)

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-LF-3V	Flow through type	CH4-LF
CH4-LFG-3V	Resistant up to 99% humidity for Flow through type	CH4-LFG

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'. (c.f. CH4-LD/CH4-LD-3V diffusion type series are available which use white colored filter on Top of cavity instead two tube on side, the detail is referable in their datasheet.)

Pin Map with J1&J2 Connectors

J-1	**CH4-LF-3V**
1/3	VDD (+3.3 VDC)
2/4	GND

J-2	**CH4-LF-3V**	**CH4-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 (0.5~3.0V)
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 JP-1 Connectors

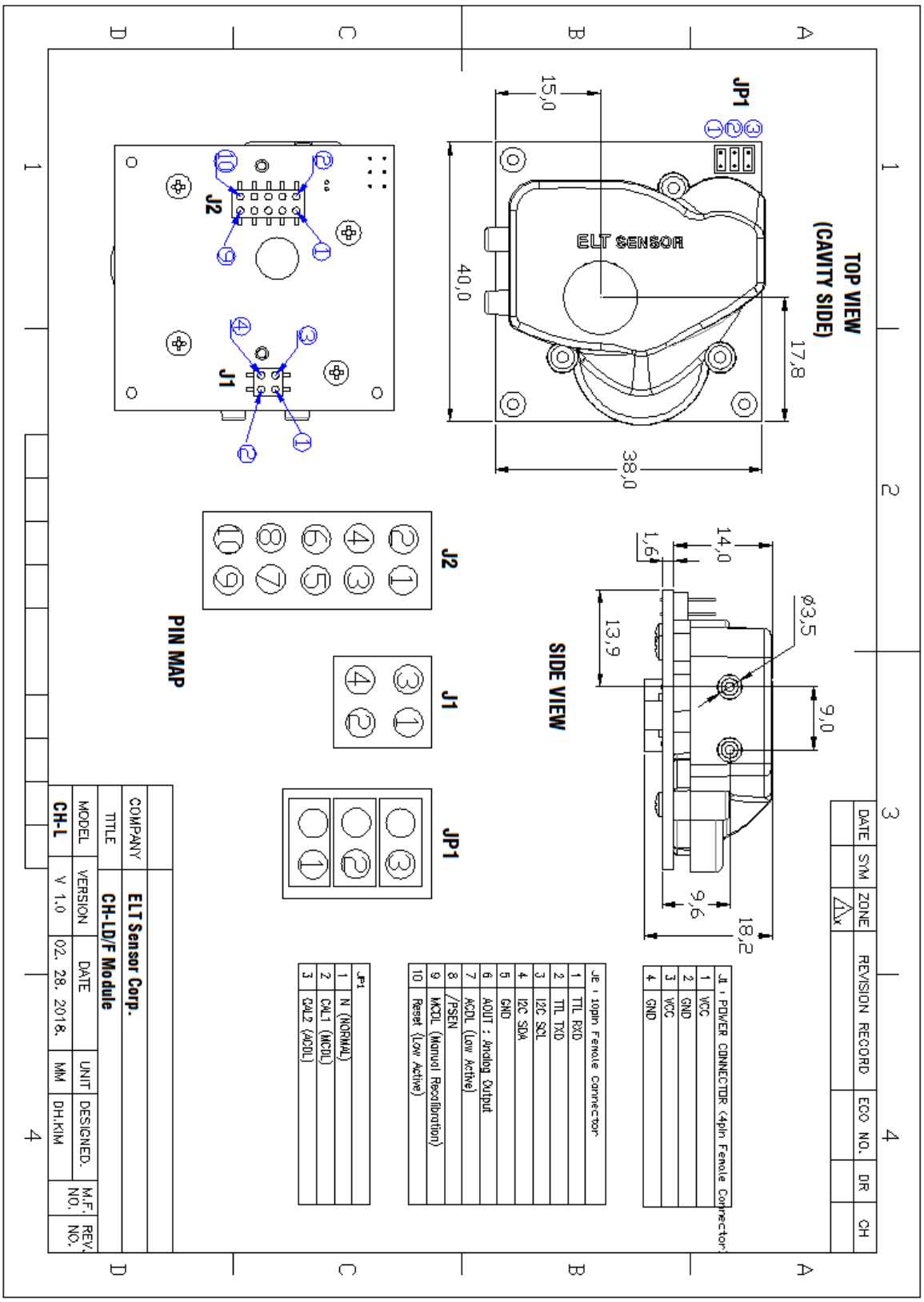
JP-1	**CH4-LF-3V**
1	N (Normal)
2	CAL1 (MCDL)
3	CAL2 (ACDL)

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

Analog Voltage (option) : 0.5~3.0V

Dimensions unit : mm

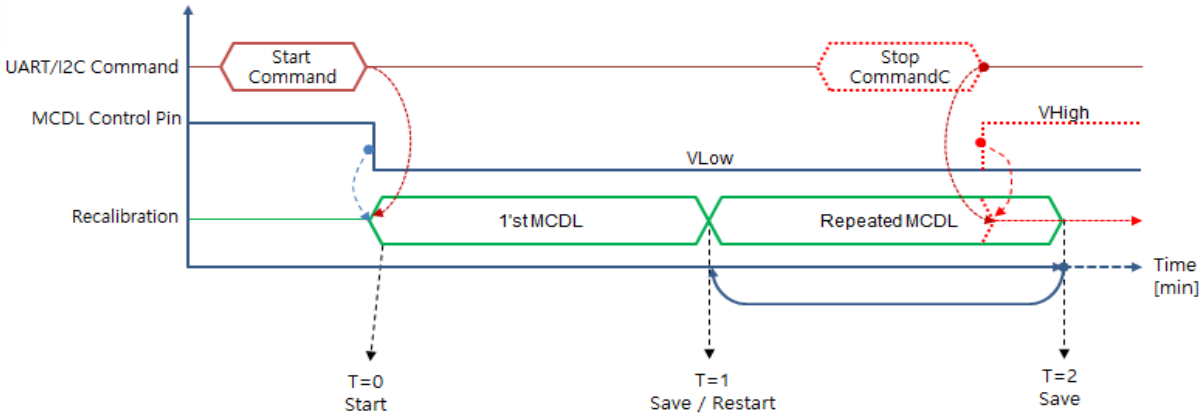


MCDL and ACDL Calibration (JP-1 Jumper function)

Calibration Mode	JP-1	Note
Active Mode 1 (Normal Mode)	'N'	- Move JP-1 to 'N', if it is not a well-ventilated room or CH4 gases remain in the room. - The reference value is set up based on the last calibration results.
Active Mode 2 (Auto-Calibration Mode)	CAL2 (='A') (ACDL)	- Move JP-1 to 'A', if the room is well ventilated and CH4 gases don't exist in it. - '0'ppm Auto Calibration is activated every 2 days after a day since power-on.
Manual Calibration Mode	CAL1 (= 'M') MCDL)	- Move JP-1 to 'M' in the condition where no CH4 gases exist when sensors showed much different PPM in severe condition. - '0'ppm Manual Calibration is activated every 2minutes. -JP-1 should be moved to 'N' or 'A' after manual calibration.

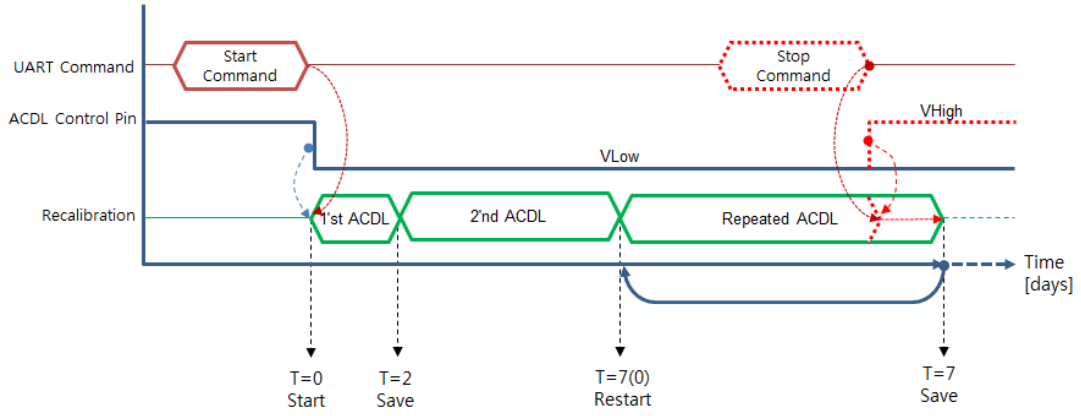
- **MCDL (1 minutes Manual Calibration)**

'0' ppm Manual Calibration can be done by giving start command or low signal to CAL1-pin at least more than 2 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 J2 pin-1,2 (RX, TX) / J2 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 J2 pin-9/ pin-7 or JP1 pin-2/pin-3

CAL1 MCDL	CAL 2 ACDL	Function	Process
Low	High	H/W MCDL	Let CH4-LF-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

'PPM' display is default,

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

D6 ~ D1	Measured value
SP	Space: 0x20
'ppm'	' ppm' string
CR	Carriage return : 0x0D
LF	Line feed : 0x0A

EX) 3,500ppm string is '0x20 0x20 0x33 0x35 0x30 0x30 0x20 0x70 0x70 0x6D 0x0D 0x0A' and showed '__3500_ppm<CR><LF>'.

'LEL(%)' display is option,

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

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>'.

In need of detail , 'UART Command Guide' could be provided by contacting Sales Rep.

I2C Communication (Only Slave Mode Operation)

Internal pull up resister 10kΩ

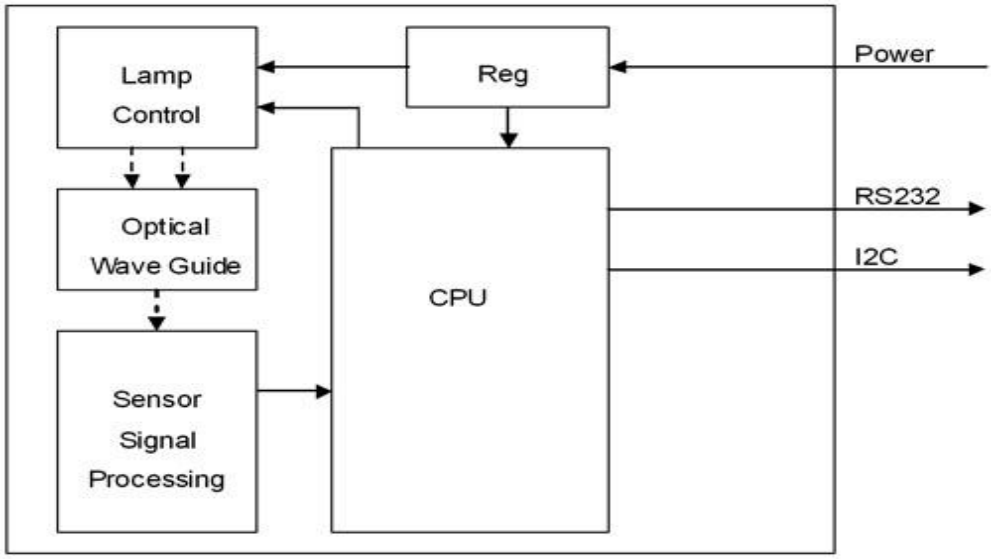
Slave Address: 0x31, Slave Address Byte: Slave Address(0x31) 7 Bit + R/W 1 Bit

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

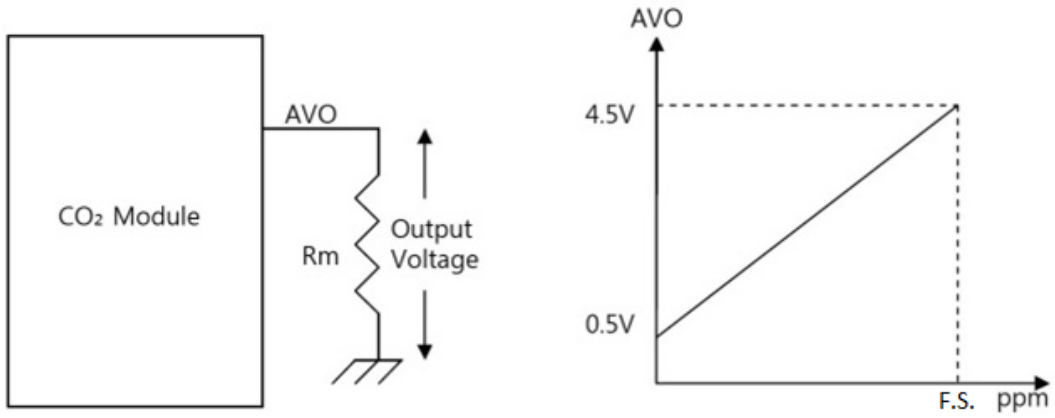
7) Read 7 Byte Receiving Data from Module and Send Acknowledge
(Delay at least 1ms for reading each byte)

Configuration	CH4	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 0~5,000 ppm .

* CH4 Measurement (ppm) = Output Voltage – 0.5 / (3 – 0.5) Voltage x 5,000ppm

EX) if the Output Voltage is 1.25V in 0~5,000ppm,

CH4 ppm= (1.25 – 0.5) V÷ (3 – 0.5)V x 5,000 ppm = 1,500ppm

※ 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.

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