General

 S-300 series is one of world's smallest NDIR CO2 sensor module, of which persistent Stability and Temperature effect resistance besides various outputs are much favored by customers in stocks raising, greenhouse, HVAC, scientific projects, etc.

ELT Sensor
Data Sheet for S-300

Features

• Non-Dispersive Infrared (NDIR) technology used

  to measure CO_2 levels.

• Pre-calibrated

• Available outputs : TTL-UART, I2C, ALARM,

                (PWM/Analog Voltage option)

• Gold-plated sensor provides long-term

  calibration stability.

• Installed re-calibration function

• ACDL (Periodical Automatic Calibration) and MCDL (Non-Periodical Manual Calibration) are available

• ROHS Directive- 2011/65/EU,
  [EN50581 : 2012,IEC 62321-3-1 : 2013].

• Size : 33mmx33mmx13.1mm

• Weight : 10 grams

S-300 Specifications

General Performance

Operating Temperature : -10 ~ 60℃

Operating Humidity : 0 ~ 95% RH (Non-condensing)

Operating Environment : Residential, Commercial spaces, Greenhouse etc.

Storage Temperature : -30℃ ~70℃

CO_2 Measurement

Sensing Method : NDIR (Non-dispersive Infrared)

Measurement Range : 0 ~ 2,000

Accuracy : ± 30ppm ± 3% of reading

Step Response Time (1/e) : 60 seconds

Sampling Interval : 3 seconds

Warming-up Time : < 6 seconds (for Operation), 5 minutes (for Accuracy)

Electrical Data

Power Input : 5V ± 5% [4]

Current Consumption : Normal mode 19mA, Peak : 240mA, Sleep < 0.5mA

 to endure up to 99% humidity for customers whose application is Greenhouse and Stock Raising, S-300A has ACDL software and calibrate weekly after once in 2day from power-on, without 'Low signal' to J12-7 and J13-13 during operation, appropriate for Indoor Air-Quality Monitoring.

Pin Map with J11&J12 Connectors

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

I2C (J-12:P3&P4) : Slave mode only, Internal pull up resister (10kΩ)
TTL Level Voltage : : $0 \leq V_{IL} \leq 0.8$, $2.0 \leq V_{IH} \leq V_{DD}$, $0 \leq V_{OL} \leq 0.4$, $2.4 \leq V_{OH} \leq V_{DD}$ (Volt)
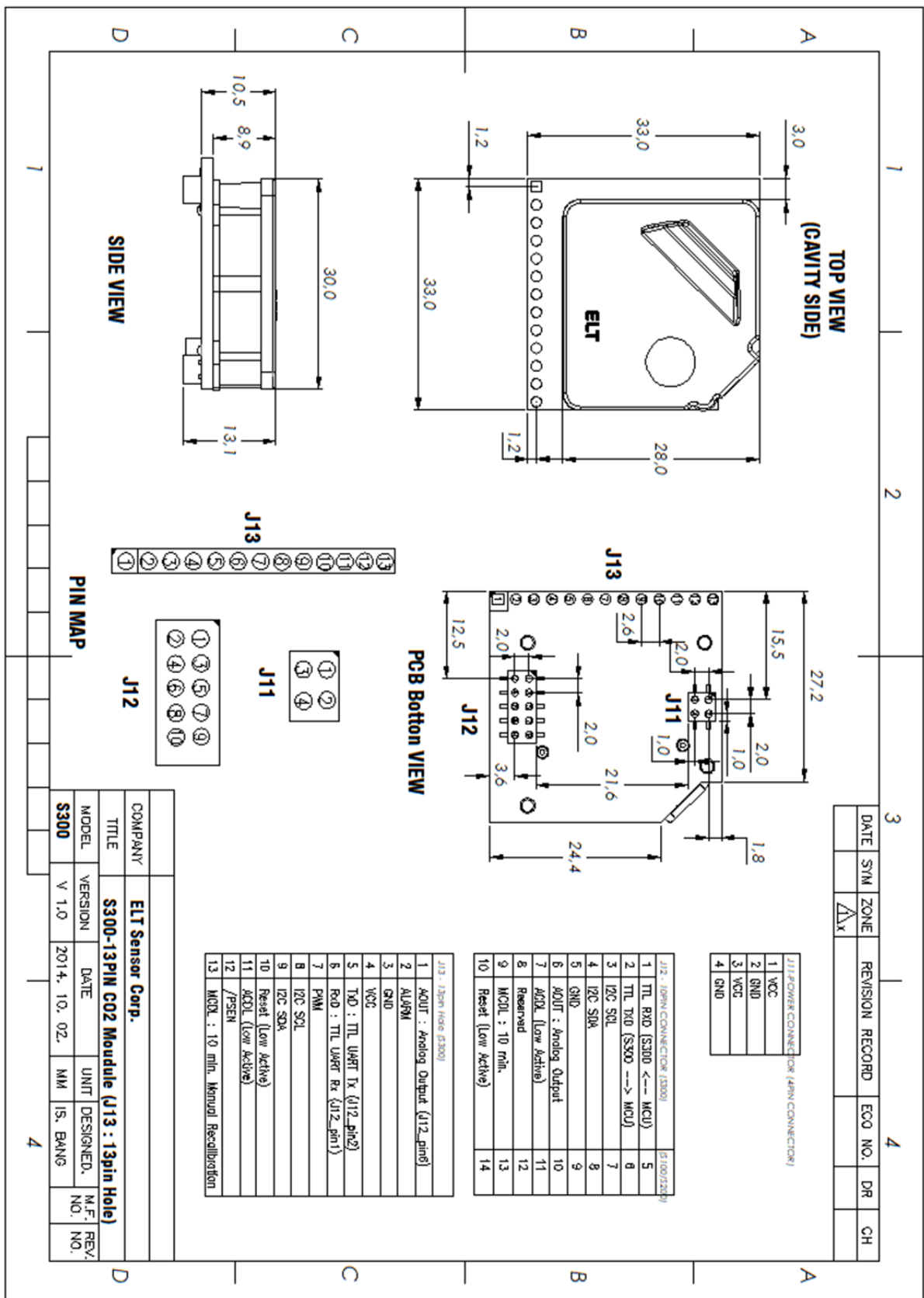
ALARM (Open Collector type)
1,000 ppm ≤ Alarm ON, 800 ppm ≥ Alarm OFF and alarming range can be change by EK-100SL with connected to PC.

Pin Map with J13 Connectors

J-13	S-300
1	Reserved
2	Alarm (Open Collector)
3	GND
4	VDD (+5V VCC)
5	TTL TXD ($\rightarrow$ CPU of Master Board)
6	TTL RXD ($\leftarrow$ CPU of Master Board)
7	Reserved
8	I2C SCL
9	I2C SDA
10	Reset (Low Active)
11	ACDL(Automatic Calibration)
12	Reserved
13	MCDL(10 min. Manual Calibration)

Dimensions unit : mm

TOP VIEW (CAVITY SIDE)

SIDE VIEW

PCB Botton VIEW

PIN MAP

J13

J12

J11

J13

J12

J11

J11 : POWER CONNECTOR [4PIN CONNECTOR]

1	VCC
2	GND
3	VCC
4	GND

J12 : 10PIN CONNECTOR (S300)   [S100/S200]

1	TTL RXD (S300 <--- MCU)	5
2	TTL TXD (S300 ---> MCU)	6
3	I2C SCL	7
4	I2C SDA	8
5	GND	9
6	AOUT : Analog Output	10
7	ACDL (Low Active)	11
8	Reserved	12
9	MCDL : 10 min.	13
10	Reset (Low Active)	14

J13 : 13pin Hole (S300)

1	AOUT : Analog Output (J12_pin6)
2	ALARM
3	GND
4	VCC
5	TxD : TTL UART Tx (J12_pin2)
6	RxD : TTL UART Rx (J12_pin1)
7	PWM
8	I2C SCL
9	I2C SDA
10	Reset (Low Active)
11	ACDL (Low Active)
12	/PSEN
13	MCDL : 10 min. Manual Recalibration

COMPANY	ELT Sensor Corp.				
TITLE	S300-13PIN CO2 Moudule (J13 : 13pin Hole)				
MODEL	S300	VERSION	V 1.0	DATE	2014. 10. 02.
				UNIT	MM
				DESIGNED.	IS. BANG
				M.F. NO.	
				REV. NO.	

DATE	SYM	ZONE	REVISION RECORD	ECO NO.	DR	CH

ACDL function (Automatic Calibration Function in Dimming light with period)

ACDL could be activated as by setting below.
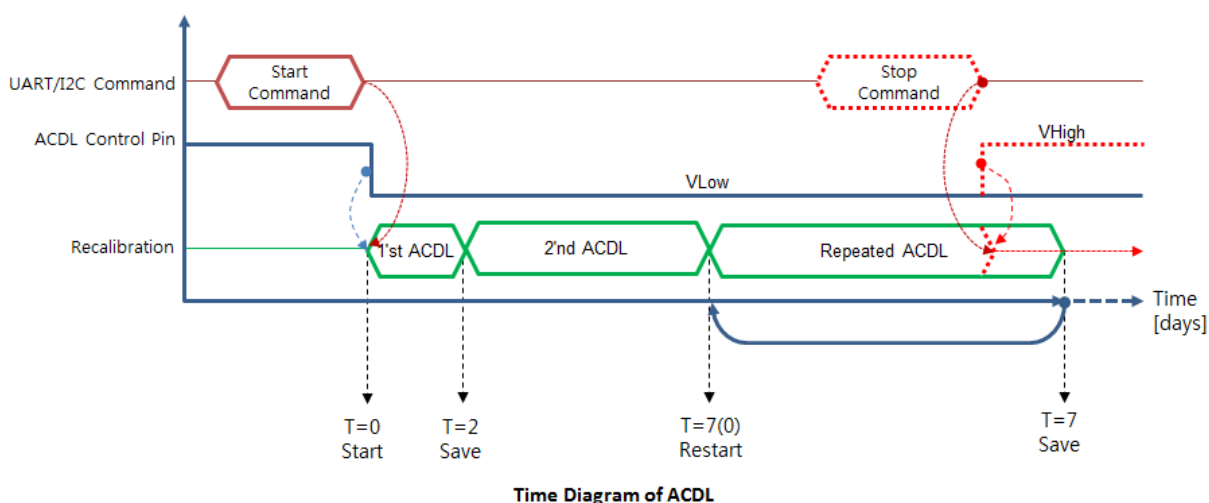
Time Diagram of ACDL

Method 1. UART Command Set; J12: pin-1 (UART-RX) and pin-2 (UART-TX) to Main-Board.
(J13: pin-6 and pin-5 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. Execute Hardware based ACDL.

J12:pin-7 or J13:pin-11	J12:pin-9 or J13:pin-13	Status	Notes
Low	**High**	**H/W ACDL**	**Calibrate weekly after 2 days since power-on**
High	High	Normal	Operate with Pre-calibrated value in Factory or previous state.

※   1. (J12:pin-7 or J13:pin-11) and (J12:pin-9 or J13:pin-13) shouldn't have 'Low' at any time.

Cf.) Unlike other S-300 series, S-300A operate with software based ACDL setting, which make sensor always operate with ACDL as default unless MCDL is activated.

Method 4**. TRB-100ST (Test and Recalibration Board)** is purchasable to executable, letting sensor be located at ambient air-flow condition and execute by moving jumper following Manual, which is downloadable on the website.

Method 5. Send string command set below to RXD-pin of Sensor on Emulation program.
EK-100SL (Evaluation kit, with Emulation program 'ELTWSD') is available.

10' MCDL function (10 minute Manual Calibration Function in Dimming light).

MCDL enable customer to calibrate as needed, MCDL keep at least 10 minute once it start and should be stopped before 18minute to avoid MCDL fetch repetition.
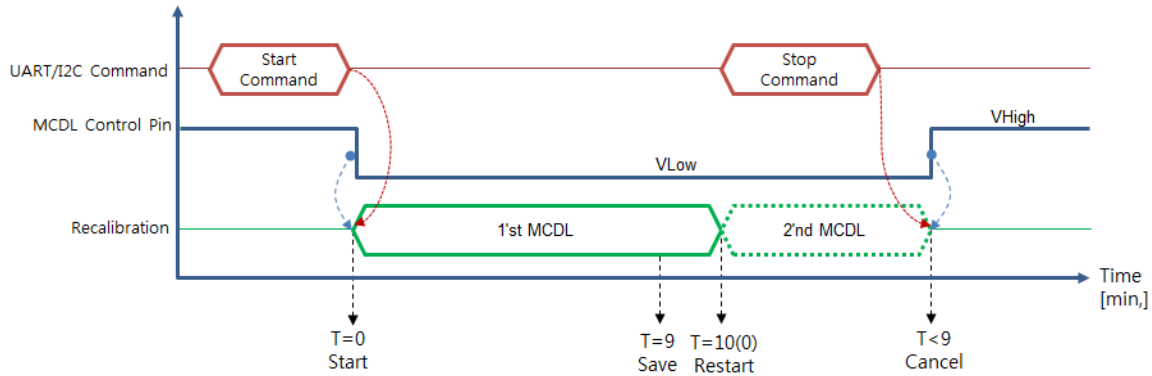
Time Diagram of MCDL

Method 1. UART Command Set;   J12: pin-1 (UART-RX) and pin-2 (UART-TX) to Main-Board   (J13: pin-6 and pin-5 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. Execute Hardware based MCDL.

J12:pin-7 or J13:pin-11	J12:pin-9 or J13:pin-13	Status	Notes
High	**Low**	**H/W MCDL**	**sensor should be located in 400ppm environment (outside) for 10 minutes**
High	High	Normal	Operate with Pre-calibrated value in Factory or previous state.

※   1. (J12:pin-7 or J13:pin-11) and (J12:pin-9 or J13:pin-13) shouldn't have 'Low' at any time.
2. Be sure to quit MCDL fetch loop before 18minute.
cf.) Unlike other S-300 series, S-300A has nothing to do with (J12:pin-7 or J13:pin-11). It is designed to execute MCDL during pin-13 get Low Active Signal. it return to ACDL as the signal to pin-13 is changed to High De-Active Signal.

Method 4. Let Sensor install on Jig Board, **TRB-100ST (Test and Recalibration Board)** with ambient air-flow condition and execute by moving jumper following Manual on the website.

Method 5. Send string command set below to RXD-pin of Sensor on Emulation program. **EK-100SL (Evaluation kit, with Emulation program 'ELTWSD')** is available.

Output Descriptions

UART Descriptions

Data Format

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

D6 ~ D1	6 byte CO2 density string
SP	Space: 0x20
'ppm'	'ppm' string
CR	Carriage return : 0x0D
LF	Line feed : 0x0A

Above 12byte consist by 6 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) 1,255 ppm, results '0x20 0x20 0x31 0x32 0x35 0x35 0x20 0x70 0x70 0x6D 0x0D 0x0A', which displays '__1255_ppm<CR><LF>'on screen.

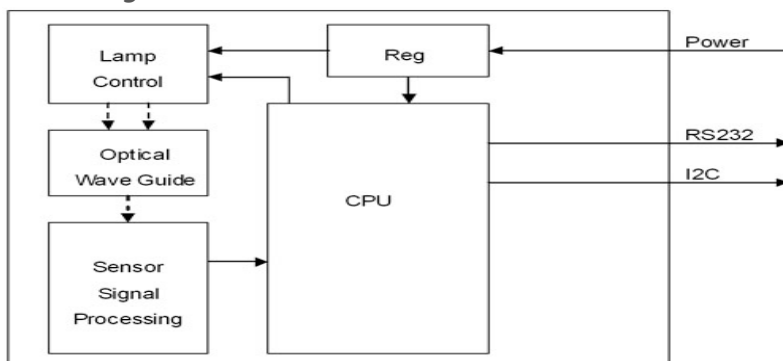## I2C Communication (Only Slave Mode Operation)

Internal pull up resister

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.

Alarm Descriptions

Alarm signal operates as Open Collector type and send TTL on signal since CO2 measured value beyond 1,000 ppm until it go down to 800 ppm. It is designed to be activated when CO2 measured value surpass 1,000 ppm and deactivated down to 800 ppm to avoid unwanted rapid switching by hysteresis effect.

<div align="center">1,000 ppm ≤ Alarm ON, 800 ppm ≥ Alarm OFF</div>
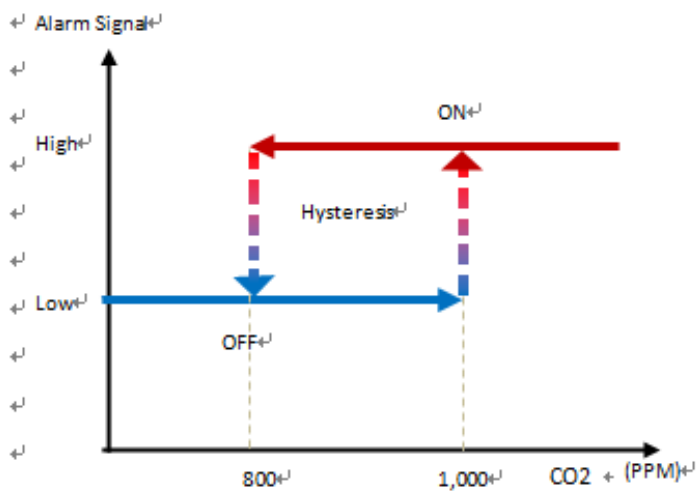
※Caution

1. Please hold only 'PCB' of sensor without holding Cavity directly to avoid the physical shock on sensor. Rough handling or Transportation could result in inaccurate reading.

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