

General

Version 2.2

S-300 series is much favored by customers because of persistent stability independent from Temperature and Long Battery-time besides high accuracy and small size.S-300 is compatible with S-100 series and S-200 series and gives wider output selection to meet customers' requests

ELT Sensor Data Sheet for S-300

**Features**

- Non-Dispersive Infrared (NDIR) technology used to measure CO₂ levels.
- Pre-calibrated
- Available outputs : TTL-UART, I2C, ALARM, PWM/Analog Voltage.
- Gold-plated sensor provides long-term calibration stability.
- Installed re-calibration function
- Operate as ACDL mode (Automatic Calibration in Dimming Light mode).
- Manual Re-Calibration function is executable.
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- Size : 33mmx33mmx13.1mm
- Weight : 10 grams

S-300 Specifications

General Performance

Operating Temperature : -10 ~ 60 °C

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

Operating Environment : Residential, Commercial spaces

Storage Temperature : -30 °C ~70 °C

CO₂ Measurement

Sensing Method : NDIR (Non-dispersive Infrared)

Measurement Range : 0 to 2,000/3,000/5,000/10,000 ppm (2/3/5 % is optional.)

Accuracy : ±30ppm ±3% of reading (S-300A : ±20ppm ±3% of reading)

Step Response Time (1/e) : 60 seconds

Sampling Interval: 3 seconds

Warming-up Time : 60 seconds

Electrical Data

Power Input : 5V ± 5%

Current Consumption : Normal mode : 25mA, Peak : 350mA, Sleep mode: < 0.5mA

Product Derivatives and Relative Functions

Products	Option List
S-300A	ACDL software,10'MCDL, UART, 1 st +2 nd ALARM, Analog Voltage or PWM, 10pin,
S-300L	Low Power, 10' MCDL UART, 1 st ALARM, Analog Voltage or PWM, 10pin,
S-300M	10' MCDL, UART, 1 st +2 nd ALARM, Analog Voltage or PWM, 10pin,
S-300G	99% Humidity for Green House,10' MCDL, UART, 1 st +2 nd ALARM, Analog Voltage or PWM, 10pin,

10 minute MCDL (Manual Calibration in Dimming Light) Function is executable in all S-300 Series. S-300G is for Greenhouse and Stock Raising which need to be resistant to humidity and S-300L is Low Power model, consumes less than 0.5mA in Sleep mode.

S-300A has ACDL (Automatic Calibration in Dimming Light) software in Sensor for Indoor Air-Quality Monitoring which could face ambient status with period. (2day at first, and every week as default).

Technical Datasheet for derivative of S-300 series could be given to you by contacting on Sales Representatives.

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

TTL Level Voltage : $0 \leq V_{IL} \leq 1.2$, $3.5 \leq V_{IH} \leq 5$, $0 \leq V_{OL} \leq 0.4$, $4.2 \leq V_{OH} \leq 5$ (Volt)

J-11	Description	
1/3	+5V VCC	
2/4	GND	

J-12	S-300	S-300 (PWM Option)
1	TTL RXD (← CPU of Master Board)	
2	TTL TXD (→ CPU of Master Board)	
3	I2C SCL	
4	I2C SDA	
5	GND	
6	Analog Voltage Output (0.5~4.5V)	2 ND Alarm (V_{5V}/V_{0V} TTL Signal Switching)
7	ACDL(Low Active)	
8	Reserved	
9	10 min. Manual Re-Calibration(MCDL)	
10	Reset (Low Active)	

Analog Voltage(J-12:P6) : 0.5~4.5V,

In case the PWM option is chosen, Alarm signal comes out instead Analog Voltage.

PWM (J-13:P2 is available) :

$$t_H = 2 \text{ msec (Start)} + 1,000 \text{ msec} \times (\text{Measurement}_{(\text{ppm})} / \text{Range}_{(\text{ppm})}), T_L = 2,000 \text{ ms} - t_H,$$

ALARM (1st Alarm : Open Collector type, 2nd Alarm : V_{5V}/V_{0V} TTL Signal Switching)

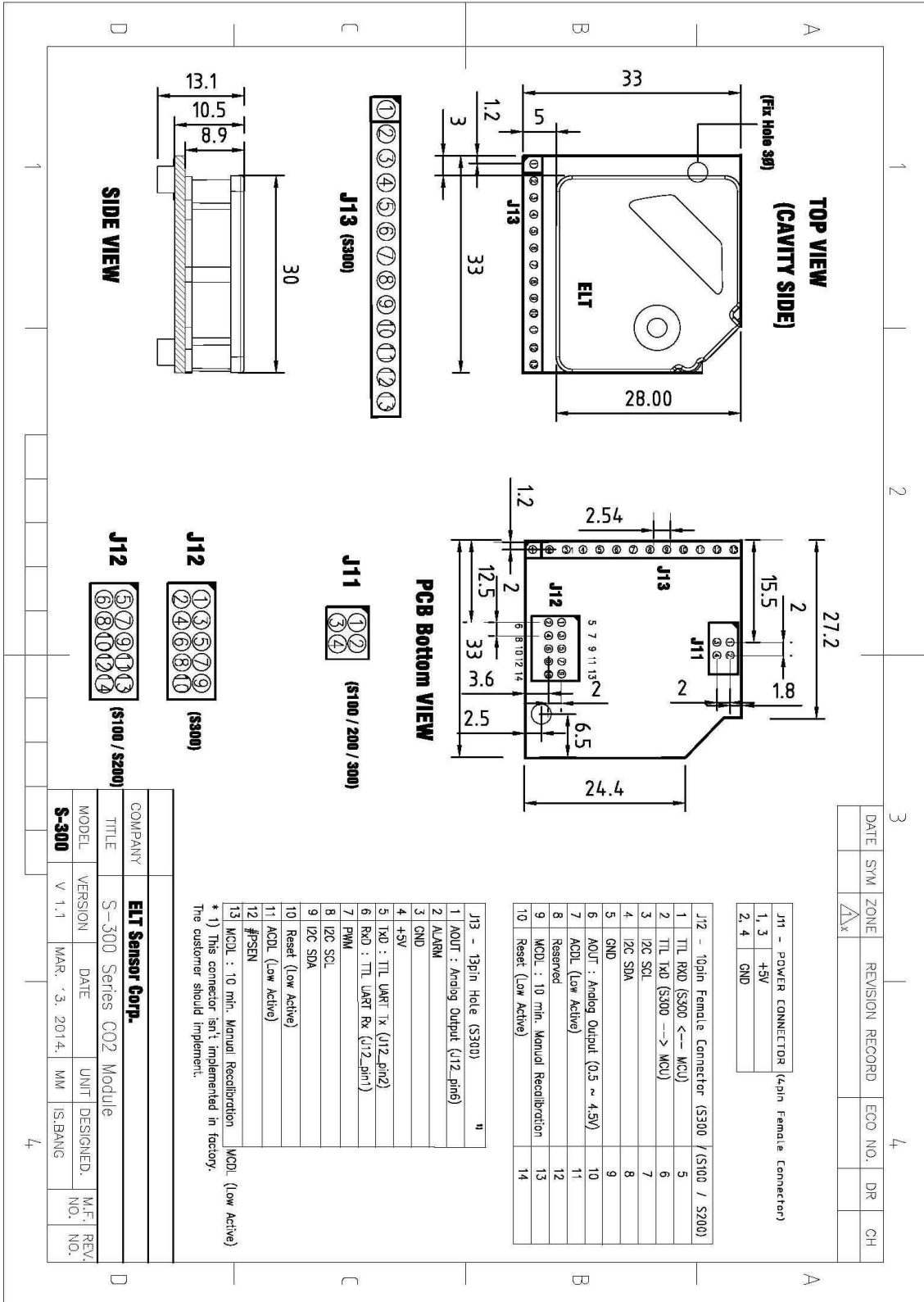
1,000 ppm ≤ Alarm ON, 800 ppm ≥ Alarm OFF

DK-100 series is available for customer who is willing to use alarm function with different range.

Pin Map with J13 Connectors

J-13	S-300	S-300 (PWM Option)
1	Analog Voltage Output (0.5~4.5V)	2 ND Alarm (TTL Signal V_{5V}/V_{0V} Switching)
2	1 st Alarm (Open Collector)	
3	GND	
4	+5V VCC	
5	TTL TXD (→ CPU of Master Board)	
6	TTL RXD (← CPU of Master Board)	
7	2 nd Alarm (V_{5V}/V_{0V} TTL Signal Switching)	PWM Output as O.C Default,
8	I2C SCL	
9	I2C SDA	
10	Reset (Low Active)	
11	ACDL (Low Active)	
12	#PSEN	
13	MCDL function	

Cavity Dimensions (unit : mm)



Output Voltage Descriptions

UART Descriptions

Data Transmit

Interval : 3 seconds

Handshake protocol : None (Data is transmitted to outer device periodically)

Data Format

B1	B2	B3	B4	B5	BL	'p'	'p'	'm'	CR	LF
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B1 ~ B5	5 byte CO2 density string
BL	Blank: 0x20
'ppm'	'ppm' string
R	Carriage return : 0x0D
LF	Line feed : 0x0A

EX) In case 1,255 ppm, 0x20 0x31 0x32 0x35 0x35 0x20 0x70 0x70 0x6D 0x0D 0x0A '1,255 ppm
<CR><LF>'

I2C Communication (Only Slave Mode Operation)

Internal pull up resistor

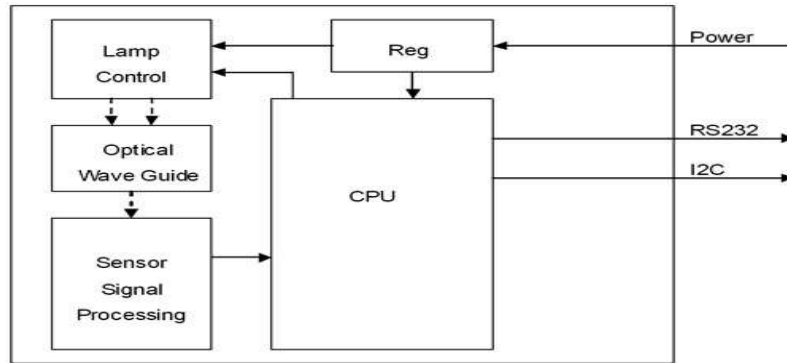
Slave Address: 0x31, Slave Address Byte: Slave Address(0x31) 7 Bit + R/W 1 Bit

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.

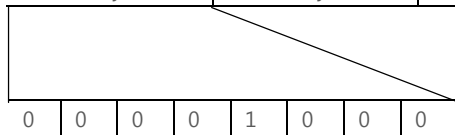
Block Diagram



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



In need of detail protocol specification and time sequence, I2C programming guide is providable by contacting Sales Rep.

AVO Description

* Measurement_(ppm) : 0.5~4.5V

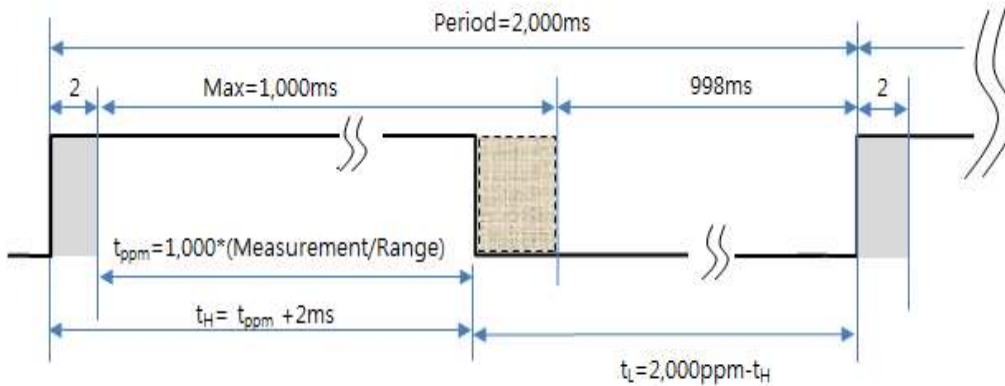
Measured Voltage 0.5V~4.5V matches proportionally to 0 ppm up to 2,000/3,000/5,000/10,000 ppm

or 2%/3%/5%. ppm

PWM Descriptions

* Measurement_(ppm) = (t_H-2msec)/1000msec x Range_(ppm) (t_H : High Pulse Width)

* Range_(ppm) : 2,000/3,000/5,000/10,000 ppm (20,000/30,000/50,000/100,000 is optional.)



EX) t_H (High Pulse Width) calculation for 400 ppm in 2,000 ppm Range.

$$*Measurement_{(ppm)} = 400 \text{ ppm} = (t_H - 2ms) / 2,000msec \times Range_{(ppm)}$$

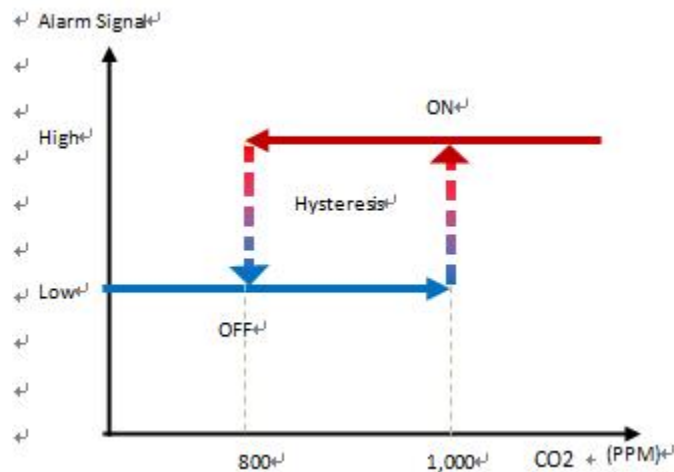
$$*t_H = 1,000 \text{ msec} * (400 \text{ ppm} / 2,000 \text{ ppm}) + 2msec = 202msec$$

(cf: $T_L = \text{Period} - t_H = 2,000 \text{ ppm} - 202 \text{ msec} = 1,798 \text{ msec.}$)

Alarm Descriptions

1st Alarm is Open Collector type which work SPST (Single Pole Single Throw) 1st Alarm is 'OFF' status at first and turn to 'ON' status since CO2 value go beyond 1,000 ppm until it go down to 800 ppm to avoid unwanted rapid switching by hysteresis effect.

1,000 ppm ≤ Alarm ON, 800 ppm ≥ Alarm OFF



2nd Alarm use 0V/5V TTL signal Switching instead of SPST (Single Pole Single Throw) method.

10 minute Re-Calibration Method.

Method 1. Apply TTL Low signal to pin-10 for 10 minutes, or

※To activate MCDL function, the user's application must be designed to give Low Active Signal to pin-10

Method 2. Let Sensor install on Jig Board (**TRB-100: Test and Recalibration Board**) with ambient air-flow condition and execute by moving jumper following Manual, which is downloadable on the website.

Method 3. Send String command set below to RXD-pin of Sensor on Emulation program.

DK-100 (Download kit, with Emulation program 'ELTWSO') is available.