

General

Version 1.13

S-300 series is one of the world's smallest CO₂ sensor modules. S-300 is much favored by customers because it's compatible with S-100 series and S-200 series and gives wider output selection to meet customers' requests besides high accuracy and small size.

ELT Sensor Data Sheet for S-300



Features

- Non-Dispersive Infrared (NDIR) technology used to measure CO₂ levels.
- Output mode : TTL UART, I2C, Alarm, AVO/PWM
- Gold-plated sensor provides long-term calibration stability
- ACDL or MCDL mode is selectable on sale.
- 10 minute Recalibration is available as default
- Size : 33mmx33mmx13.1mm
- Weight : 10 grams

S-300 Specifications

General Performance

Operating Temperature : 0 ~ 50℃

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

Operating Environment : Residential, Commercial spaces

Storage Temperature : -20℃ ~60℃

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 ±5% of measured

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 : 300mA, Sleep mode: < 2mA

Product Derivatives and Relative Functions

Products	Option List
S-300A	ACDL, AVO&UART&I2C
S-300AP	ACDL, UART&I2C,PWM
S-300AR	ACDL, UART&I2C, ALARM
S-300M	MCDL, AVO&UART&I2C
S-300MP	MCDL, UART&I2C,PWM
S-300MR	MCDL, UART&I2C, ALARM
S-300ML	MCDL, AVO&UART&I2C, Low Power
S-300MLP	MCDL, UART&I2C, Low Power, PWM
S-300MLR	MCDL, UART&I2C, ALARM
S-300MG	MCDL, AVO&UART&I2C, Green House
S-300MGP	MCDL, UART&I2C, Green House, PWM
S-300MGR	MCDL, UART&I2C, Green House, ALARM

Pin Map with J11&J12 Connectors

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

J-12	Description
1	TTL RXD (S300 ← MCU)
2	TTL TXD (S300 → MCU)
3	I2C SCL
4	I2C SDA
5	GND
6	Analog Voltage Output (0.5~4.5V)
7	S-300: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

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)

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

Pin Map with J13 Connectors

J-13	S-300A/M/ML/MG	S-300AP/MP/MLP/MGP	S-300AR/MR/MLR/MGR
1	Analog Voltage Output (0.5~4.5V)	Alarm (TTL Signal V_{5V}/V_{0V} Switching)	Alarm (TTL Signal V_{5V}/V_{0V} Switching)
2	Alarm (Open Collector)	PWM Output as O.C Default TTL-Signal output is option	Alarm (Open Collector)
3	GND	GND	GND
4	+5V VCC	+5V VCC	+5V VCC
5	TTL TXD (→ CPU of Master B'd)	TTL TXD (→ CPU of Master B'd)	TTL TXD (→ CPU of Master B'd)
6	TTL RXD (← CPU of Master B'd)	TTL RXD (← CPU of Master B'd)	TTL RXD (← CPU of Master B'd)

PWM (J-13:P2 is available)

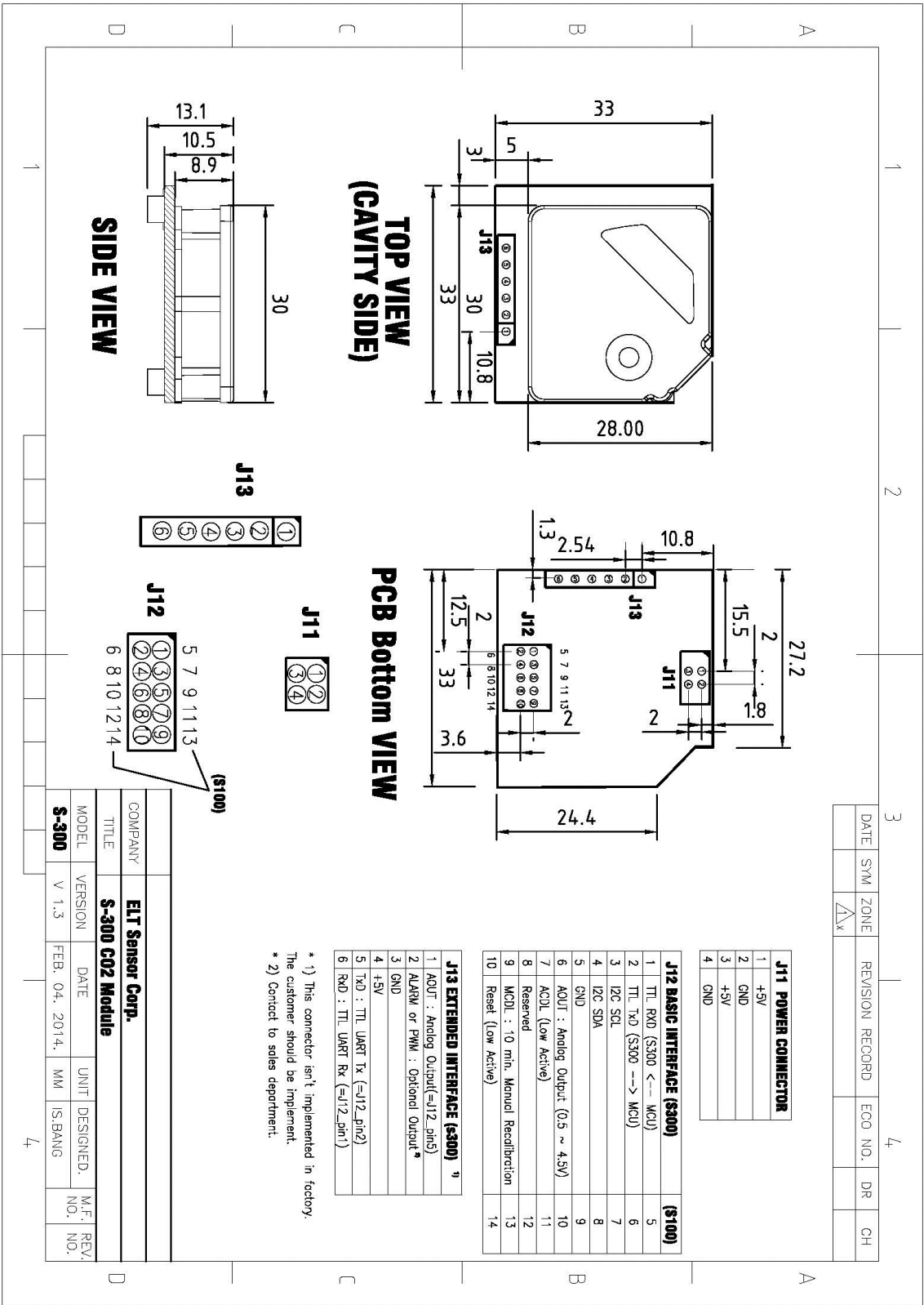
The sink current should be less than 40mA.

In case TTL Signal Output is needed, please contact Sales Rep.

ALARM (Open Collector type)

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

Cavity Dimensions (unit : mm)



* 1) This connector isn't implemented in factory.
The customer should be implement.
* 2) Contact to sales department.

Output Voltage Descriptions

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

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 resister

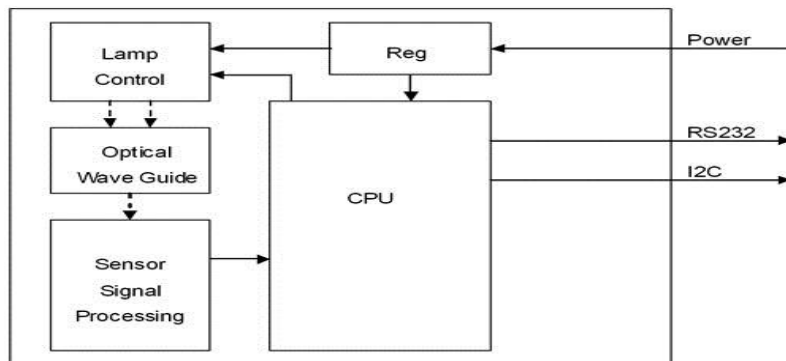
Slave Address: 0x31, Slave Address Byte: Slave Address(0x31) 7 Bit + R/W 1 Bit

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

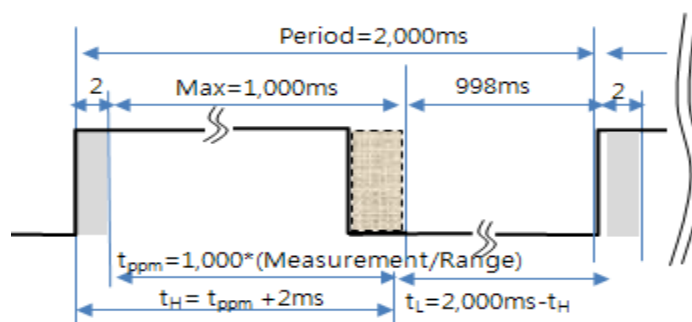
0	0	0	0	1	0	0	0
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In need of detail protocol specification and time sequence, I2C programming guide is providable by contacting Sales Rep.

PWM Descriptions

* $\text{Measurement}_{(\text{ppm})} = (t_H - 2\text{msec}) / 1000\text{msec} \times \text{Range}_{(\text{ppm})}$ (t_H : High Pulse Width)

* $\text{Range}_{(\text{ppm})}$: 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.

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

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

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

10 minute Re-Calibration Method.

Method 1. Apply TTL Low signal to pin-13 for 10 minutes, or

※To activate MCDL function, the user's application must be designed to give Low Active Signal to pin-13

Method 2. Enable Using U-ART String command TTL-RXD pin or

Method 3. Use Jig Board (TRB-100: Test and Recalibration Board, On sale as option).

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