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Electro Optical Components

Manual for NDIR CO₂ Module EOC-IR300



EOC-IR300 NDIR CO₂ Module

Please read the manual carefully before you use this product, and operate the module in its recommended way. Keep this manual, you may need its help in the future.

Electro Optical Components (EOC) uses the latest technology to develop and upgrade products like the EOC-IR300. EOC keeps the right to improve the product without any notice.

If users disassemble or replace any part of the product not in the way suggested in this manual, the risks must be taken by the users themselves.

The details of the products, including the color and style, depend on the product you order.



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EOC-IR300 NDIR CO₂ Module

1. Introduction

The EOC-IR300 is a NDIR CO₂ gas module that has a precision light chamber, state of the art electronics and intelligent software. With the help of single light source, dual channel detector, and microprocessor, EOC-IR300 can accurately measure the gas concentration using flow through or diffusion.

In the EOC-IR300 module, temperature compensation is included as well as firmware to null out any nonlinearity. It has all the advantages of NDIR gas detection including good selectivity, high sensitivity, long life and independence from O₂ interference.

EOC-IR300 is suitable for the use in a variety of CO₂ gas detection applications including indoor air monitoring, agriculture etc.



2. Technical Data

Working conditions

Description	Symbol	Value	Unit
Storage temperature	T _{stg}	-20 to 80	°C
Working temperature	T _A	0 to +50	°C
Working humidity	H _A	0 to 90	% RH
Working pressure	P _A	0.8 to 1.2	ATM

Electric characteristics

Description	Symbol	Min.	Typical	Max.	Unit
Supply power	V _s	4.6	5	5.4	V



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Maximum current	I_{\max}		130	160-	mA
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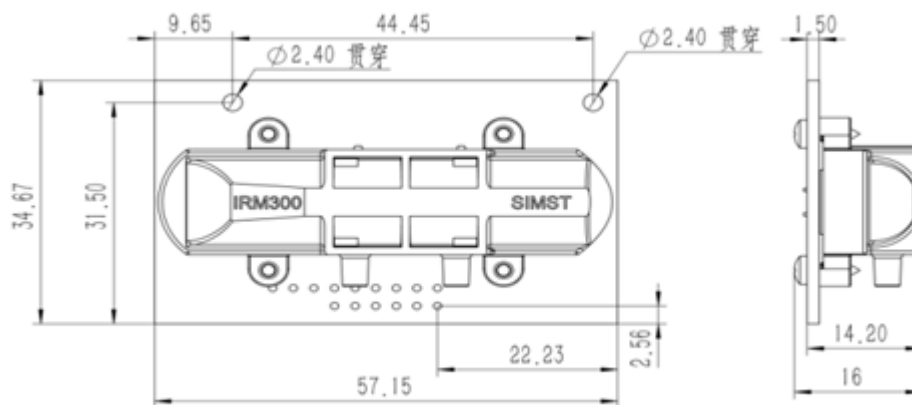
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Light current	I_{avg}		60	70	mA
Frequency	f	0.2	1	2	Hz
Preheat time	t_{warm}	90	120	180	Sec

Performance characteristics

Description		Min	Typical	Max	Unit
Detection range		0	2000	50000	ppm
Detection accuracy		-	$\pm 50\text{ppm} \pm 3\% \text{FS}$	-	ppm
T90	diffusing	-	60	90	Sec
	pumping	-	10	20	Sec
Repeatability	Zero		$<\pm 80$		ppm
	50% FS	-	$<\pm 8\% \text{FS}$	-	
Lifetime		3	5	10	Year

3. Dimensions



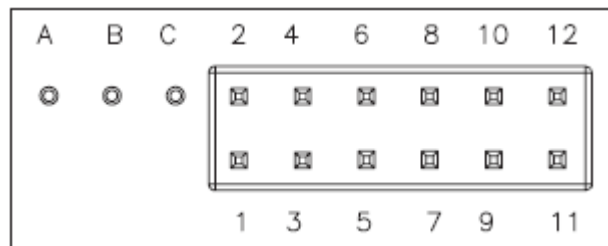


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4. Signal Output

Output Mode: UART, Analog-Voltage(Optional), IIC(Optional), PWM(Optional) Interface
Definition:

A	TX (UART)
B	RX (UART)
C	VCC
1	VCC
2	GND
3	GND
4	DAC OUT (0.4 ~ 4 V or 0~4V)
5	SCL
6	No Connect
7	SDA
8	PWM (Option)
9	MCDL
10	TX (UART)
11	RX (UART)
12	GND



Note: When module is started cold, the output concentration in the first two minutes are not stable.

4.1 Analog voltage

Output range of DAC (0.4V~4.0V) responses the gas concentration range (0~FS) .
0V~4.0V can also be ordered.



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4.2 UART Protocol

Baud rate: 19200bps, 8 bytes, first byte is stop, no check byte

Concentration READ and RETURN in HEX code

Zero calibration and SPAN calibration in ASCII, the byte of each frame is not steady, and which start from 0x32, and end in 0x21.

4.3 IIC Protocol

When working in slave mode of IIC, the module can be connected to an external MCU with an internal pull-up resistor.

The slave address is: 0x31

Slave address mode:

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

Writing address: 0x62, reading address: 0x63.

Send orders from the Master:

- 1) Send START
- 2) Send the address of writing (slave address+ R/W Bit(0) = 0x62) and check the reply
- 3) Send the command of reading (ASCII'R': 0x52) and check the reply
- 4) Send STOP
- 5) Send START
- 6) Send the address of reading (slave address + R/W Bit(1) = 0x63) and check the reply
- 7) Read 7 bytes from the module and send the reply

	Concentration of CO ₂		Reserve	Reserve	Reserve	Reserve
0x08	High concentration Bytes	Low concentration bytes	0x00	0x00	0x00	0x00

- 8) Send STOP



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4.4 PWM Output

PIN 8 is the PWM output, definition is:

Concentration range:	0ppm to 2000ppm CO ₂
Cycle:	1001 ms ±5%
High level output of initial period:	0.5ms (nominally)
Central period:	1000.0ms ±2%
Low level output of end period:	0.5ms (nominally)

Formula to calculate the CO₂ concentration in PWM:

$$C_{ppm} = 2000 \times (TH - 0.5ms) / (TH + TL - 1ms)$$

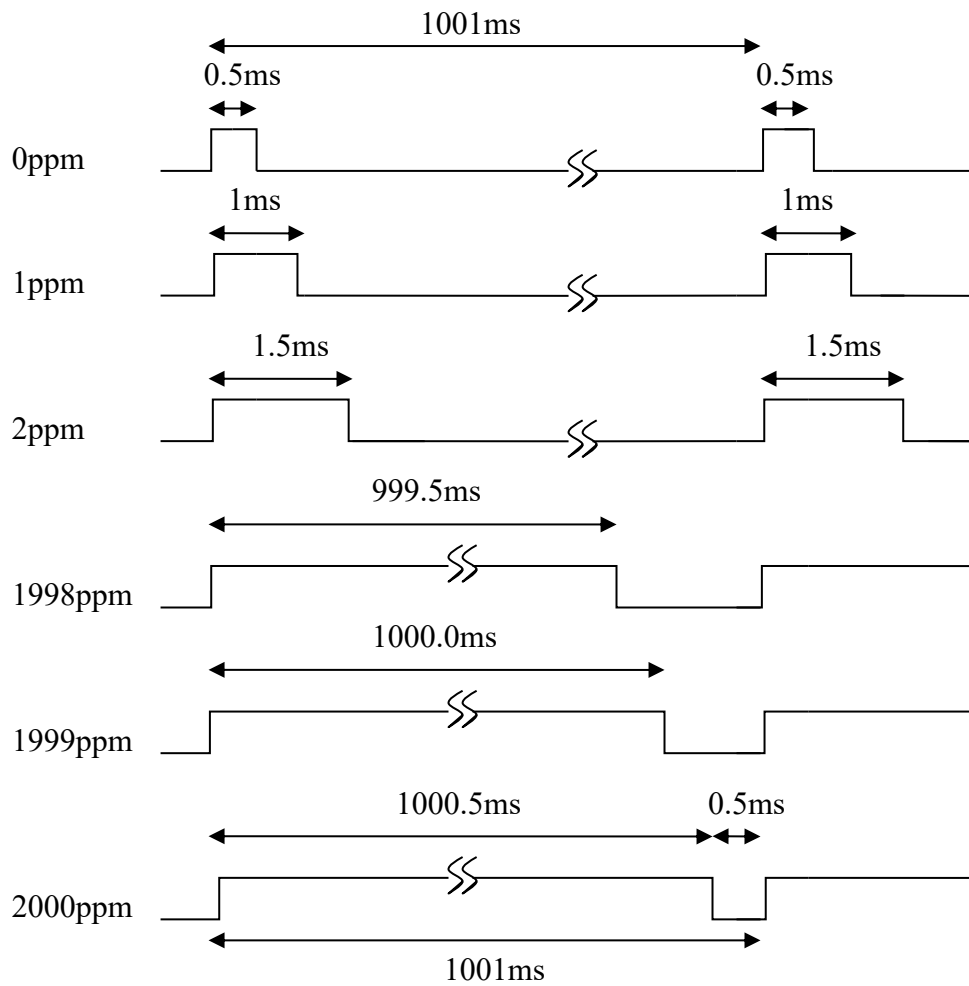
where Cppm is the CO₂ concentration, unit in ppm;

TH is the time of high level in one cycle.

TL is the time of low level in one cycle.



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PWM OUTPUT



4.5 DATA and Calibration

Baud rate: 19200bps, 8 bytes, first byte is stop, no check byte
 Concentration READ and RETURN in HEX code

4.5.1 If concentration should be uploaded automatically in ASCII, following is the format :

32	32	x	x	x	x	x	32	p	p	m	\r	\n
----	----	---	---	---	---	---	----	---	---	---	----	----

For example: output of 12345 ppm:

		1	2	3	4	5		p	p	m
--	--	---	---	---	---	---	--	---	---	---

0x20, 0x20, 0x31, 0x32, 0x33, 0x34, 0x35, 0x20, 0x70, 0x70, 0x6d,

4.5.2 Zero Calibration in N₂ atmosphere

STA	Command	Checksum	END
0x23	0x57 0x31	0x36 0x36	0x21

STA: 0x23 0x23 means start
 Command: 0x57 0x31 0x57 means writing;

0x31 means zero calibration in N₂ CheckSum
 : 0x36 0x36 is the CheckSum which is the ASCII code of a
 sum of the XOR of all data except STA and END.

END: 0x21 0x21 means close

The command of zero calibration should be sent after the module stays in N₂ atmosphere for 5 min.

4.5.3 .3 SPAN Calibration

STA	Command	Gas Cctn					Checksum	END
0x23	0x57 0x32	GC1	GC2	GC3	GC4	GC5	H L 0x21	

STA: 0x23 0x23 means start;

Command: 0x57 0x32 0x57 means write;
 0x32 means SPAN calibration;

Gas Cctn: means the standard concentration of the
 gas, the value of concentration should be a percentage of the full scale.



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For example: the standard concentration of the calibration gas is 500ppm, the full scale of the sensor is 5000ppm, that means

Gas Cctn=500/5000=10%, the command should be:

STA	Command		Gas Cctn					CheckSum		END
0x23	0x57	0x32	0x30	0x30	0x30	0x31	0x30	0x35	0x34	0x21

CheckSum: 0x35 0x34 is the CheckSum which is the ASCII code of a sum of the XOR of all data except STA and END.

END: 0x21 0x21 means close

The command of SPAN calibration should be sent after the module stays in standard gas atmosphere for 5 min.

4.5.4 Clean Air Calibration

Clean air calibration should be done only when the output is quite different from the true value. There are two ways to calibrate in clean air: Manual calibration and CW calibration

Manual calibration

Manual calibration can set the value to the default value 420ppm.

What you need to do is to connect the PIN9 and PIN12 together for more than 5 seconds. After that, the display will show 420.

CW calibration

CW calibration is a single-point calibration which set the concentration to a optional one. As the concentration of outside fresh air is 390ppm-450ppm generally we can also set a proper value you want. For example 400ppm.

The command is consisted of 16 numbers with the format:



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235735 3X3X3X3X3X 3Y3Y 21

Here, **235735** is the start of command, in which 23 means command, 57 means write, and 35 means clean air calibration;

21 is the end of this command.

XXXXX in 3X3X3X3X3X means the optional concentration, the unit is ppm.

For example: if the optional concentration is 517ppm, it will be written as 3030353137,

If it is 89321ppm, it will be written as 3839333231.

YY in 3Y3Y is the XOR of 57353X3X3X3X3X, for example, as the XOR of 350ppm is 54, 3Y3Y should be 3534.

Just for example:

2357353030333030353121 means 300ppm

2357353030333530353421 means 350ppm

2357353030333830353921 means 380ppm

2357353030343030353621 means 400ppm

2357353030343230353421 means 420ppm

2357353030343530363321 means 450ppm

2357353030363030353421 means 600ppm

2357353031303030353321 means 1000ppm

2357353031353030353621 means 1500ppm

Note: Do not breath close to the air inlet when calibrating, it will cause large deviation.

5. Installation instructions

The distance between the installation holes is 44.45 mm.

Connect the module with a client through the double-row socket with distance of 2.54 mm.

6. Maintenance and storage

Please calibrate the module in regularly, in general, three months or less is



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suggested.

The module cannot work in dusty environment for a long time. Supply power should be in its proper range.

7. How to place order

In order to get the product you want, please specify the following information when place your order:

- 1) Model of the module,
- 2) Measuring Range of the module For example: IRM300 0-2000ppm $\pm 50\text{ppm} \pm 3\%$

8. Contact information

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