SpO2 OEM Module

(Model : ICOM_PLUS)

Contents

1. Composition

1-1. Order Selection Guide

Item	Name	Figure	Order Number
OEM SpO2 Module	ICOM_PLUS	Fig. No.1	ICOM_PLUS#1
Wafer for Sensor	PCB Connector for Sensor Harness	Fig. No.2	WFH01
Wafer for Communication and Power	PCB Connector for Communication and Power Harness		
Housing Connector for Sensor	Wire Connector for Sensor Harness	Fig. No.3	HSH01
Housing for Communication and Power	Wire Connector for Communication and Power Harness		
Sensor Housing Wire	Harness Wire for Sensor	Fig. No.4	HWS01
Communication and Power Housing Wire	Harness Wire for Communication and Power	Fig. No.5	HWC01
RS-232C Adaptor	Adaptor for PC COM Port	Fig. No.6	APC01
PC Program	Evaluation PC Program		EPC01
SpO2 Reuseable Sensor	Finger Adult	Fig. No.7	RFA01
	Finger Child	Fig. No.8	RFC01
	Finger Soft	Fig. No.9	RFS01
	Earlobe	Fig. No.10	REL01
	Forehead	Fig. No.11	RFH01
SpO2 Disposable Sensor	Finger Adult	Fig. No.12	DFA01
	Finger Child	Fig. No.13	DFC01
	Neonate and Multisite	Fig. No.14	DNM01
	Forehead	Fig. No.15	DFH01

1-2. Figures

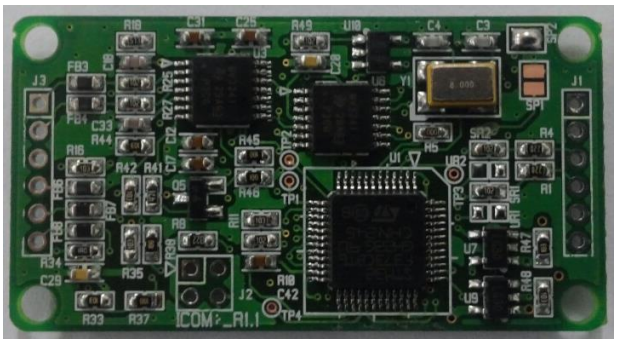


Fig. 1 (ICOM_PLUS)

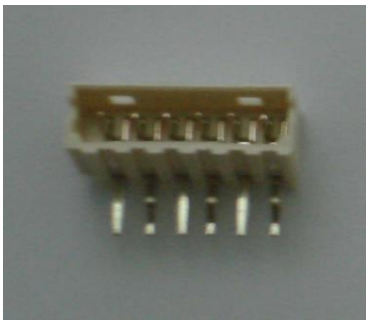


Fig.2

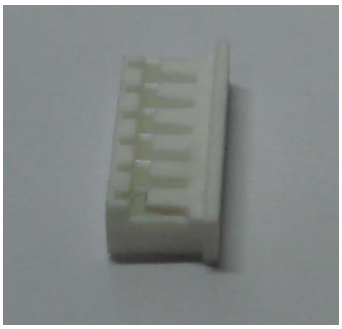


Fig.3

Fig.4

Fig 4 Connection

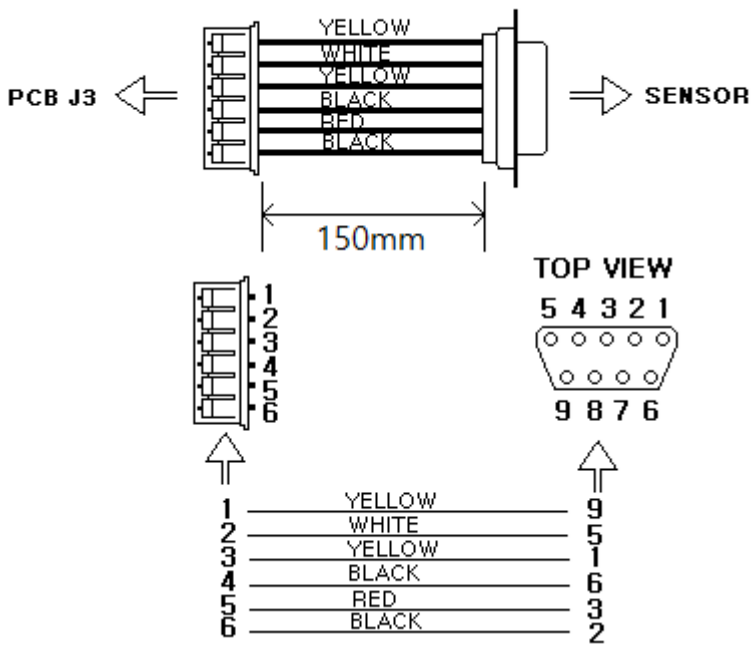


Fig.5

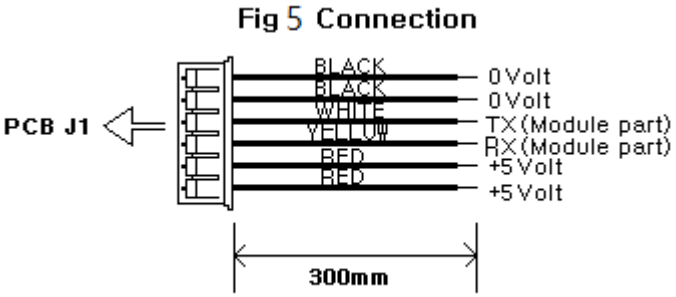


Fig 5 Connection
PCB J1
BLACK
BLACK
WHITE
YELLOW
RED
RED
0 Volt
0 Volt
TX (Module part)
RX (Module part)
+5 Volt
+5 Volt
300mm

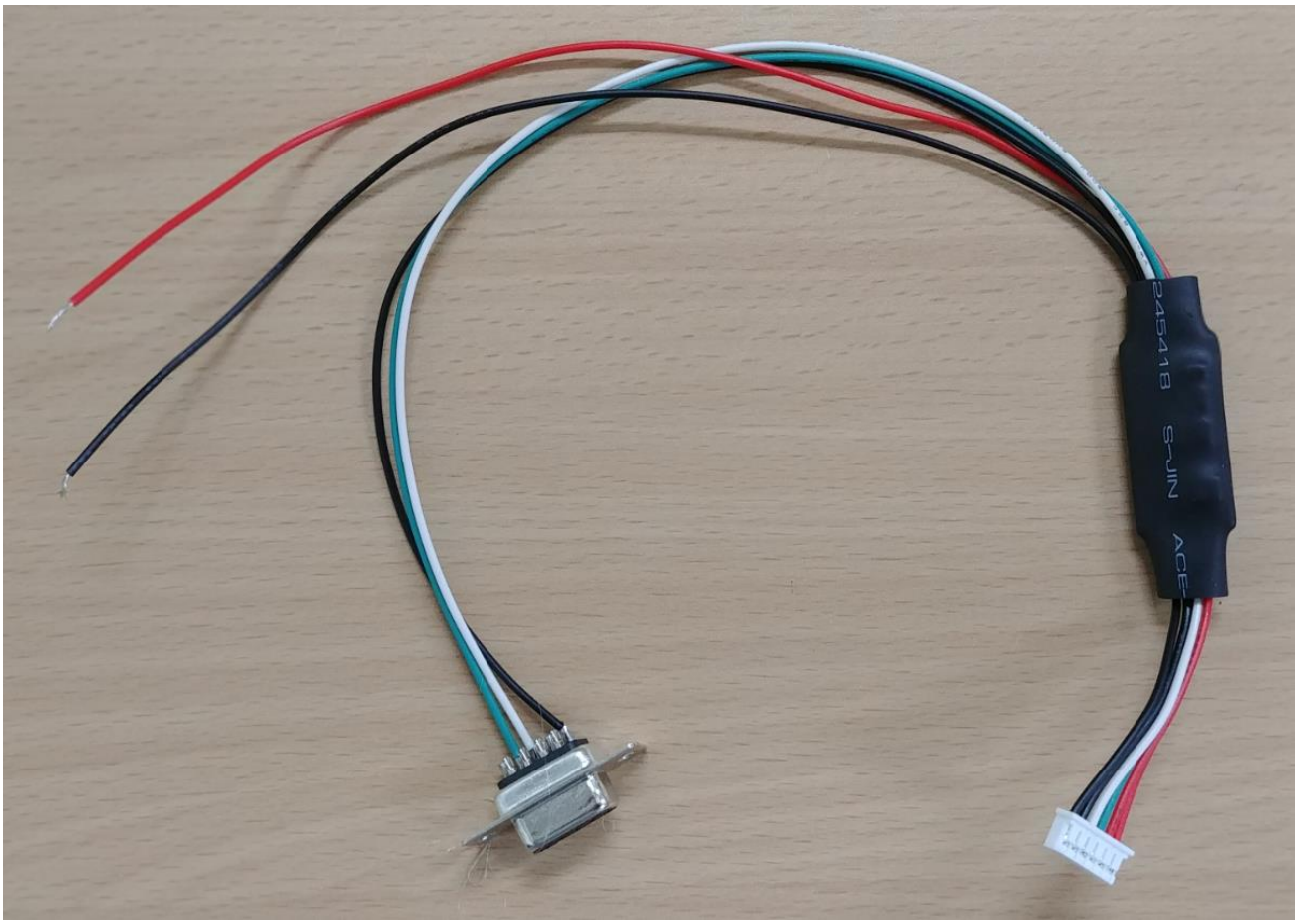

245418
S-JIN
ACE

Fig.6

Fig.7

Fig.8

Fig.9

Fig.10

Fig.11

Fig.12

Fig.13

Fig.14

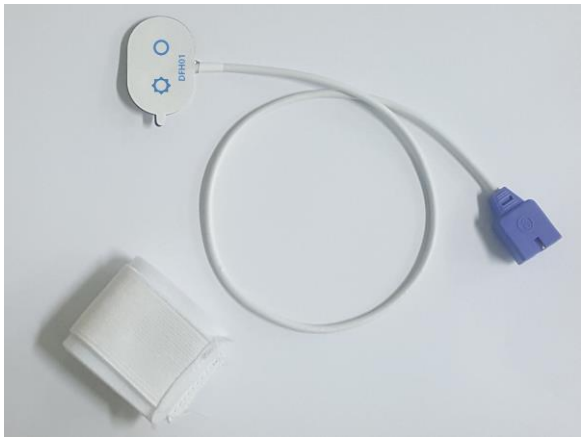
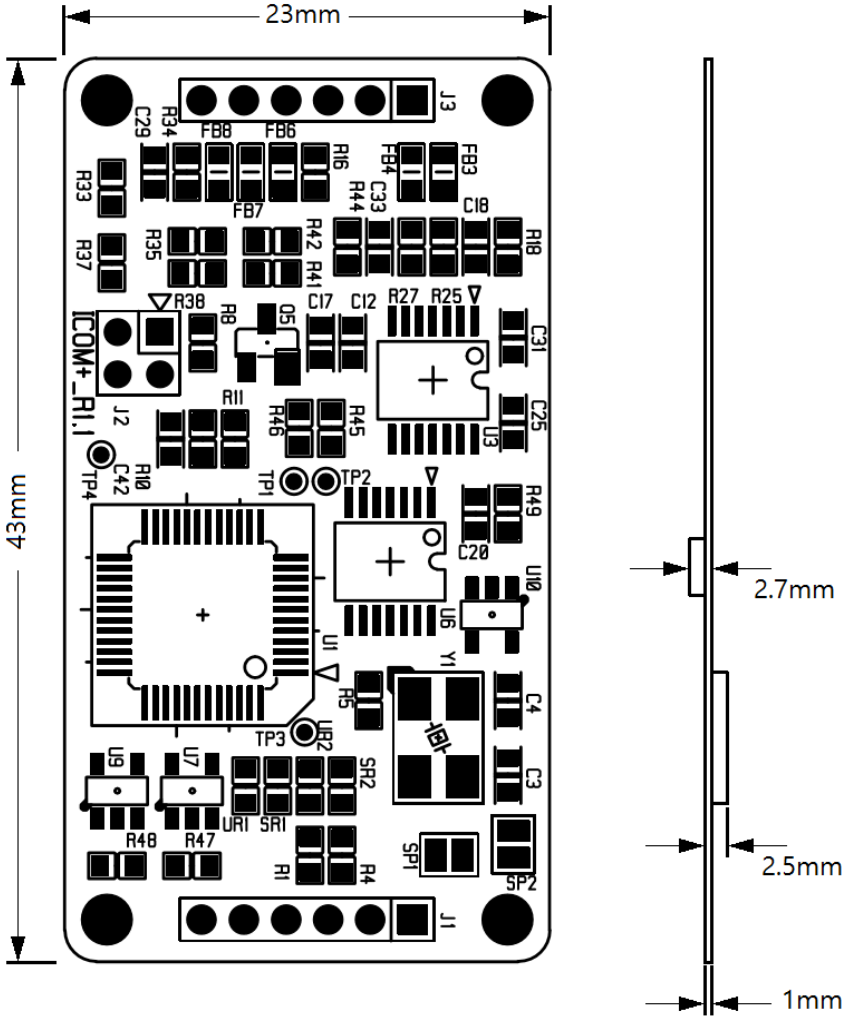


Fig.15

Fig.16

Fig.17

2. PCB Dimension



3. Specifications

<table>
<tr><td>Dimension</td><td colspan="3">43 x 23 x 3.3mm(Width x Length x Height)</td></tr>
<tr><td>Weight</td><td colspan="3">Approximate 70g</td></tr>
<tr><td>Power Source</td><td colspan="3">DC5Volt ±5%(Option DC3.3V), 100mA</td></tr>
<tr><td>Power Consumption</td><td colspan="3">Maximum 183mWatt, Minimum 50mWatt at DC5V
(Maximum 121mWatt, Minimum 33mWatt at DC3.3V)</td></tr>
<tr><td rowspan="7">Measuring Range</td><td rowspan="2">Pulse Rate</td><td>Measuring Range</td><td>25 – 255bpm</td></tr>
<tr><td>Accuracy</td><td>±1bpm</td></tr>
<tr><td rowspan="5">SpO2</td><td>Measuring Range</td><td>0 – 100%</td></tr>
<tr><td rowspan="4">Accuracy</td><td>±1%(90 – 100%)</td></tr>
<tr><td>±2%(80 – 89%)</td></tr>
<tr><td>±3%(60 – 79%)</td></tr>
<tr><td>Unspecified(Under 60%)</td></tr>
<tr><td colspan="2">Perfusion Pulse Amplitude</td><td>0.1 – 20%</td></tr>
<tr><td>Response Time</td><td colspan="3">≤4sec, in case of Pulse Rate 80bpm</td></tr>
<tr><td>Recovery Time</td><td colspan="3">≤4sec, in case of Pulse Rate 80bpm</td></tr>
<tr><td rowspan="2">Parameter Average</td><td colspan="3">ICOM Protocol :
Adaptive Pulse Rate Ex) 10th, in case of 80bpm</td></tr>
<tr><td colspan="3">ICOM_PLUS Protocol
Programmable Variable</td></tr>
<tr><td>Wide Patient Range</td><td colspan="3">Neonate – Infant – Adult</td></tr>
<tr><td rowspan="2">Interface Communication</td><td>UART TTL</td><td colspan="2" rowspan="2">Asynchronous Operation
Baud rate 38400bps
8 Data bit, 1 Stop bit, no parity bit</td></tr>
<tr><td>USB COM Port</td></tr>
<tr><td colspan="4">Features :
Monitors neonates through adults.
Low Power Consumption
Easy Interfacing
Compact Size
Digital signal processing technology enhances performance during low perfusion, patient motion and other forms of signal interference.</td></tr>
</table>

4. Protocol

4.1 Protocol

-. UART [TTL Level (0~5[V])]

-. Asynchronous Operation

-. Baud rate : 38400bps

-. 8 Data bit

-. 1 Stop bit

-. no parity bit

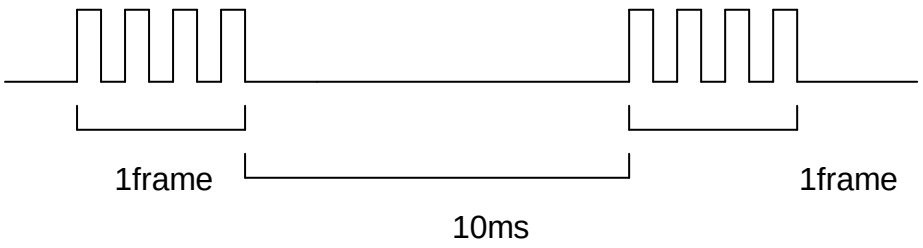
4.2 ICOM Communication protocol

-. STX = 0xFA

-. ETX = 0xFB

-. Total 11byte Transmit

-. STX + Wave(2byte) + Hr(2byte) + Spo2(2byte) + Bar data(1byte) + Wave gain(1byte) + Status(1byte) + ETX



-. Wave, Hr and SpO2 are Decimal to Hex data

Ex1) Wave=3500, Hr=125, SpO2=98, Bar data=5, Wave gain=2, Status=3

0xFA + 0x35 + 0x00 + 0x01 + 0x25 + 0x00 + 0x98 + 0x05 + 0x02 + 0x03 + 0xFB

(STX) (Wave) (Hr) (Spo2) (Bar data) (Wave gain) (Status) (ETX)

Ex2) Wave=1234, Hr=85, SpO2=96, Bar data=10, Wave gain=10, Status=0

0xFA + 0x12 + 0x34 + 0x00 + 0x85 + 0x00 + 0x96 + 0x10 + 0x10 + 0x00 + 0xFB

(STX) (Wave) (Hr) (Spo2) (Bar data) (Wave gain) (Status) (ETX)

-. Communication data range

Wave=0 ~ 5000 (sensor or finger is open = 0x2500)

Hr=0 ~ 255 (sensor or finger is open = 0x9999)

SpO2=0 ~ 100(sensor or finger is open = 0x9999)

Bar data=0~10

Wave gain=0~10

Status= refer to the Status

- Status

Bit	Showing	
Bit0	0	Sensor Open
	1	Sensor In
Bit1	0	Finger Open
	1	Finger In
Bit2	0	Reserve
	1	Reserve
Bit3	0	Reserve
	1	Reserve
Bit4	0	
	1	Moving while measuring
Bit5	0	
	1	No signal for a period
Bit6	0	
	1	Pulse beep
Bit7	0	Reserve
	1	Reserve

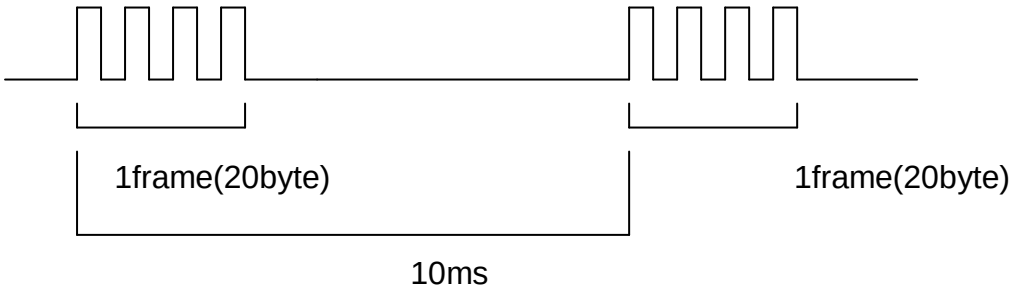
4.3 ICOM_PLUS Communication protocol

4.3.1 Data Out of Module

- STX = Hex(0x02) ---------- 1byte
- ETX = Hex(0x03) ---------- 1byte
- All Data are ASCII, except (STX, ETX, Sensor Information, Status)

4.3.1.1 Basic Form

- STX(1byte) + mode(1byte) + Wave(4byte) + Bar data(2byte) + Sensor Information(1byte) + TX data(10byte) + ETX(1byte)
- Total 20byte Transmit



4.3.1.1.1 mode 1

- STX + '1' + Wave(4byte) + Bar data(2byte) + Sensor Information(1byte) + Hr(3byte) + Spo2(3byte) + PI(3yte) + Status1(1byte) + ETX

4.3.1.1.2 mode 2

- STX + '2' + Wave(4byte) + Bar data(2byte) + Sensor Information(1byte) + Wave gain (3byte) + Average Q'ty(1byte) + RR Interval time(4byte) + Version(2byte) + ETX

4.3.1.1.3 mode 3

- STX + '3' + Wave(4byte) + Bar data(2byte) + Sensor Information(1byte) + Raw Hr(3byte) + Raw Spo2(3byte) + Raw RR Interval time (4byte) + ETX

4.3.1.1.4 mode 4

- STX + '4' + Wave(4byte) + Bar data(2byte) + Sensor Information(1byte) + Reserve(10byte) + ETX

4.3.1.1.5 Example

- mode 1

0x02 + ‘1’ + 0x34 + 0x33 + 0x32 + 0x31 + 0x30 + 0x35 + 0x83 +

STX mode1 Wave(4321) Bar data(05) Sensor Information

0x31 + 0x32 + 0x35 + 0x30 + 0x39 + 0x38 + 0x31 + 0x32 + 0x33 + 0x80 +

Hr (125) Spo2 (098) PI (12.3) Status

0x03

ETX

- mode 2

0x02 + ‘2’ + 0x31 + 0x32 + 0x33 + 0x34 + 0x30 + 0x39 + 0x83 +

STX mode2 Wave(1234) Bar data(09) Sensor Information

0x31 + 0x32 + 0x33 + 0x30 + 0x31 + 0x32 + 0x33 + 0x34 + 0x31 + 0x32 +

Wave gain (12.3) Average 0 RR Interval Time(1234) Version (1.2)

0x30

ETX

- mode 3

0x02 + ‘3’ + 0x31 + 0x32 + 0x33 + 0x34 + 0x30 + 0x35 + 0x83 +

STX mode3 Wave(1234) Bar data(05) Sensor Information

0x30 + 0x39+ 0x35 + 0x30 + 0x39 + 0x38 + 0x31 + 0x32 + 0x33 + 0x34 +

Raw Hr(095) Raw Spo2 (098) Raw RR Interval Time(1234)

0x03

ETX

- mode 4

0x02 + ‘4’ + 0x31 + 0x32 + 0x33 + 0x34 + 0x30 + 0x35 + 0x83 +

STX mode4 Wave(1234) Bar data(05) Sensor Information

0x30 + 0x30 + 0x30 + 0x30 + 0x30 + 0x30 + 0x30 + 0x30 + 0x30 + 0x30

Reserve

0x03

ETX

4.3.1.1.6 Communication Data Length

- Wave = 0 ~ 5000 (When is no Sensor nor no Finger, Wave = 2500)
- Hr = 0 ~ 255 (bpm)
- Spo2 = 0 ~ 100 (%)
- Bar data = 0 ~ 10
- PI = 0.1 ~ 19.9 (%)
- Wave gain = 0.1 ~ 20.0
- Average Quantity = 0 ~ 3 (‘0’=2nd, ‘1’=4th, ‘2’=8th, ‘3’=16th) (Default =‘2’[8th])
- Sensor Information = Refer to Table(4.2.1.1.7), 0x80 ~ 0xFF
- Status = Refer to Table(4.2.1.1.8), 0x80 ~0xFF
- Hr Time = 0 ~ 9999 (ms)
- Version = 0.0 ~ 9.9

4.3.1.1.7 Sensor Information Table

Bit	Description	
Bit0	0	No Sensor
	1	Connected Sensor
Bit1	0	No Finger
	1	In Finger
Bit2	X	Reserve
Bit3	1	Pulse Beep Sound
Bit4	1	Motion at Measuring
Bit5	1	No Signal
Bit6	1	Searching Signal
Bit7	Always 1	

4.3.1.1.8 Status Table

Bit	Description	
Bit0	0	Reserve
	1	Reserve
Bit1	0	Enable for Wave Auto Gain Control
	1	Disable for Wave Auto Gain Control
Bit2	0	Reserve
	1	Reserve
Bit3	0	Reserve
	1	Reserve
Bit4	0	Reserve
	1	Reserve
Bit5	0	Reserve
	1	Reserve
Bit6	0	Reserve
	1	Reserve
Bit7	Always 1	

4.3.2 Protocol Data in Module

- STX = Hex(0x02) ---------- 1byte
- ETX = Hex(0x03) ---------- 1byte
- Total 7byte Transmit

4.3.2.1 Enable Wave Auto Gain Control

- STX + 0 + ‘A‘+ ‘U’ + ‘T’ + ‘O’ + ETX

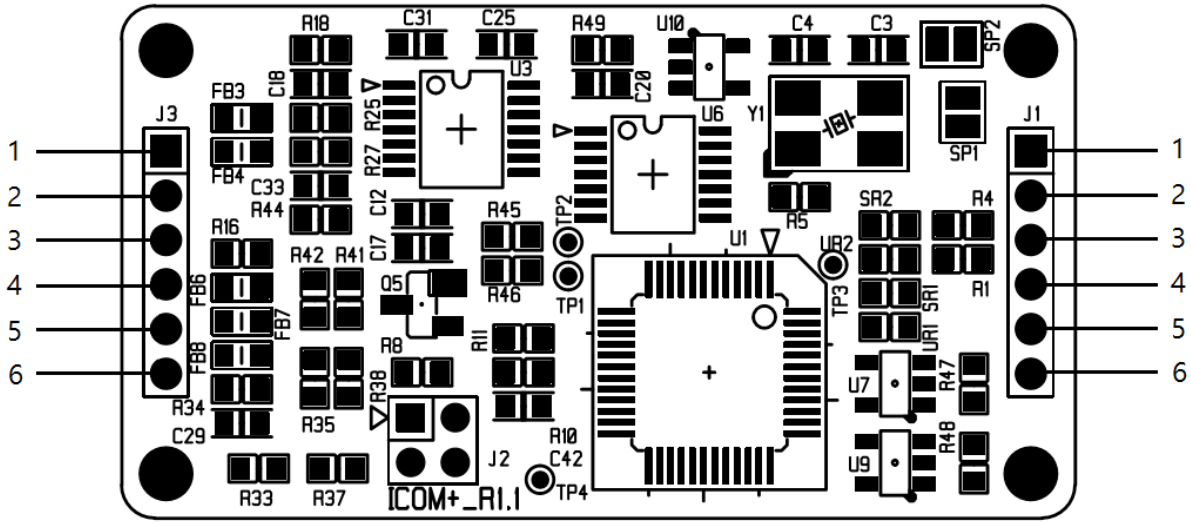
4.3.2.2 Disable Wave Auto Gain Control

- STX + 1 + ‘M‘+ ‘A’ + ‘N’ + ‘U’ + ETX

4.3.2.3 Programmable Average Quantity

- STX + 2 + ‘A‘+ ‘V’ + ‘G’ + ‘0’ + ETX
- Average Quantity = 0 ~ 3 (‘0’=2nd, ‘1’=4th, ‘2’=8th, ‘3’=16th) (Default =‘2’[8th])

5. SpO2 sensor / Power connection



5.1 Power connection (PCB J1)

Pin NO. (PCB J1)	Name	Description
1	VCC	+5Volt
2	VCC	+5Volt
3	RX(Module part)	0~5Volt
4	TX(Module part)	0~5Volt
5	GND	0Volt
6	GND	0Volt

5.2 Sensor connection (PCB J3)

Pin NO. (PCB J3)	Name	Description	D-sub(9pin) connector's NO.
1	- Photodiode	- Photodiode in Probe	9
2	+ Photodiode	+ Photodiode in Probe	5
3	Sensor	Sensor ID	1
4	GND	GND	6
5	IR LED	Input IR drive voltage from module	2
6	RED LED	Input RED drive voltage from module	3