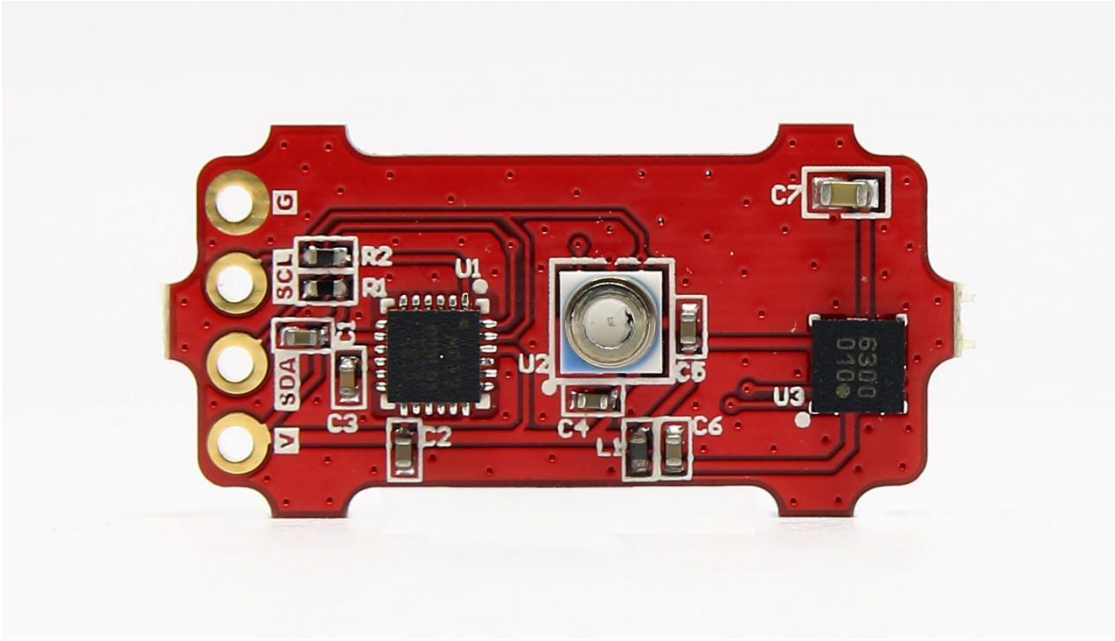

Mazu Sensor Board
User Guide

ROVMAKER. LTD.

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REVISION HISTORY			
Release	**Date**	**Author**	**Comments**
1.0	2019/03/15	Jenching Lee	1st Release

Introduction

The Mazu sensor board, designed by ROV MAKER for the DIY-ROV market, integrates MS5837-30BA pressure and temperature sensor, MPU-9250A inertial measurement unit and IST8310 eCompass.

An important feature of the Mazu sensor board is its IST8310 IC, which replaces 3-axis Hall-effect magnetic sensor in MPU-9250A and provides accurate compass function. IST3810 makes compass calibration easy before use.

The Mazu sensor board uses the I2C interface to make the control board work well with MPU-9250A (IMU), MS5837-30BA and IST8310 (eCompass). This design helps simplify the connection between the Mazu sensor board and the control board. Meanwhile, users can save the hassle of developing software simply by using the sample code provided by ROV MAKER.

The Mazu sensor board is accompanied with a set of Acrylic holders. They provide an easy way to make Mazu waterproof underwater. All that needs to be done is put the Mazu board in the holder and fill the gaps with Epoxy adhesive glue, thus sealing Mazu tight from leaks.

The following are the specifications and features of the Mazu sensor board. If you have any questions or concerns, please contact us at rovmaker@rovmaker.com.

Features

The Mazu Sensor Board is designed for ROV / AUV piloting underwater.

- Dimensions: 23.8 mm (L) x 10.8 mm (W) x 1.5 mm (H)
- 4 Pin to the control board: VDD , GND, SDA, SCL
- Working voltage: 3.3 V
- I2c I/F : Please refer to circuit diagram for the slave address of dedicated sensors.
- MPU-9250A (IMU)
- MS5837-30BA (Pressure & Temperature sensor)
- IST8310(eCompass)

The Mazu sensor board integrates MPU-9250A(IMU), MS5837-30BA and IST8310(eCompass). With the accessories and Epoxy, it is easy to provide 65-m waterproofing through the user's DIY. While the board is designed for both an underwater drone and the ROV Voyager II, it can be applied to other applications such as Quadcopter/Drone, IOT devices, heading and so on.

On-board MPU-9250A (IMU), a 9-axis inertial measurement unit, includes triple-axis MEMS gyroscope, triple-axis MEMS accelerometer and triple-axis MEMS magnetometer, which generate raw data related to motion. The control board (the ROV baroque board or Arduino) can read the raw data of MPU-9250A (IMU) collected via I2C and calculate the yaw/roll/pitch values in Euler angels.

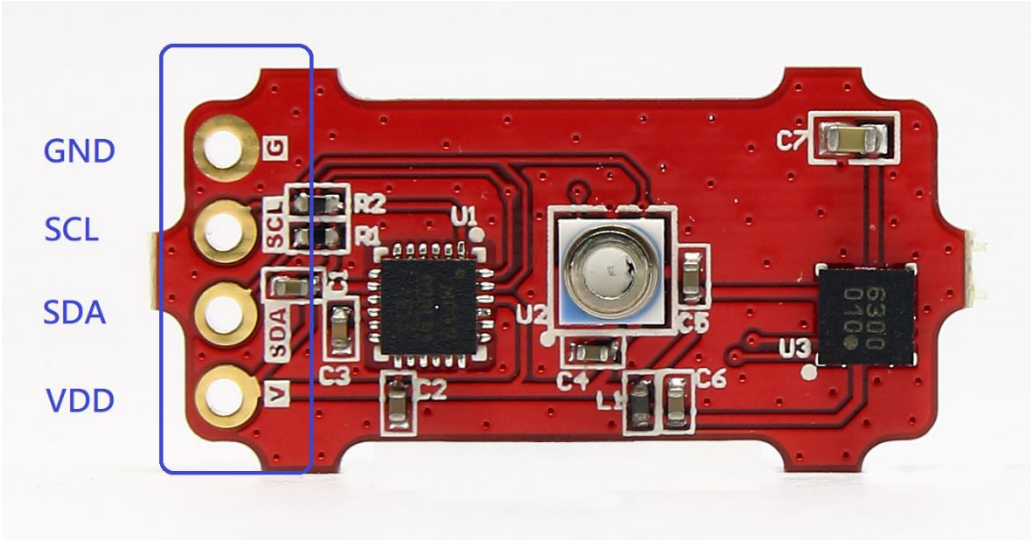
On-board MS5837-30BA, which is composed of piezo-resistive pressure sensor and temperature sensor, can use formula to provide the flying height of a drone, the depth of an ROV underwater and information regarding temperature.

On-board IST8310(eCompass) is a 3-axis digital magnetometer, which replaces the 3-axis MEMS magnetometer of MPU-9250 to aim for better accurate readings of the Earth's magnetic north pole. The eCompass also provides easy calibration prior to use. All the user needs to do is to hold the board and move it in either clockwise-and-counterclockwise or

back-and-forth directions. An embedded driver is needed to support the MSM7621A platform. To get the software library running for your platform, please contact ROVMAKER and offer your tool chain and compiler flag.

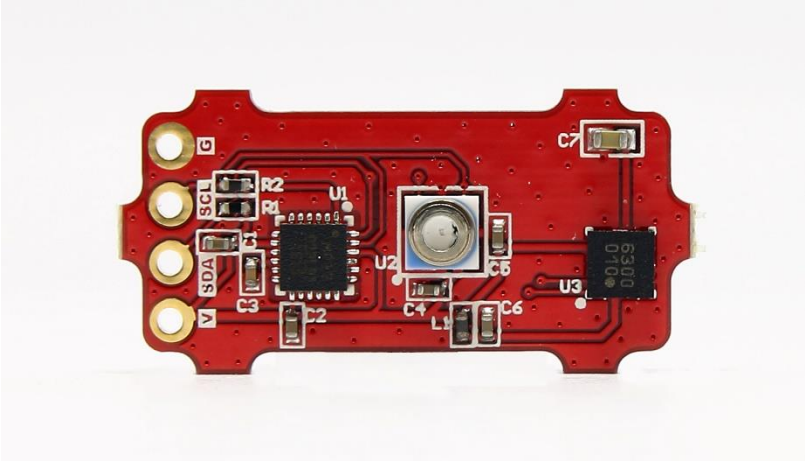
The Mazu sensor board provides the I2C interface for the control board (the ROV baroque board or Arduino, etc) The I2C interface of the Mazu sensor board consists of V, SDL, SCL and G pins. The control board provides power through V and G pins, while SDL and SCL are devoted to I2C transmission.

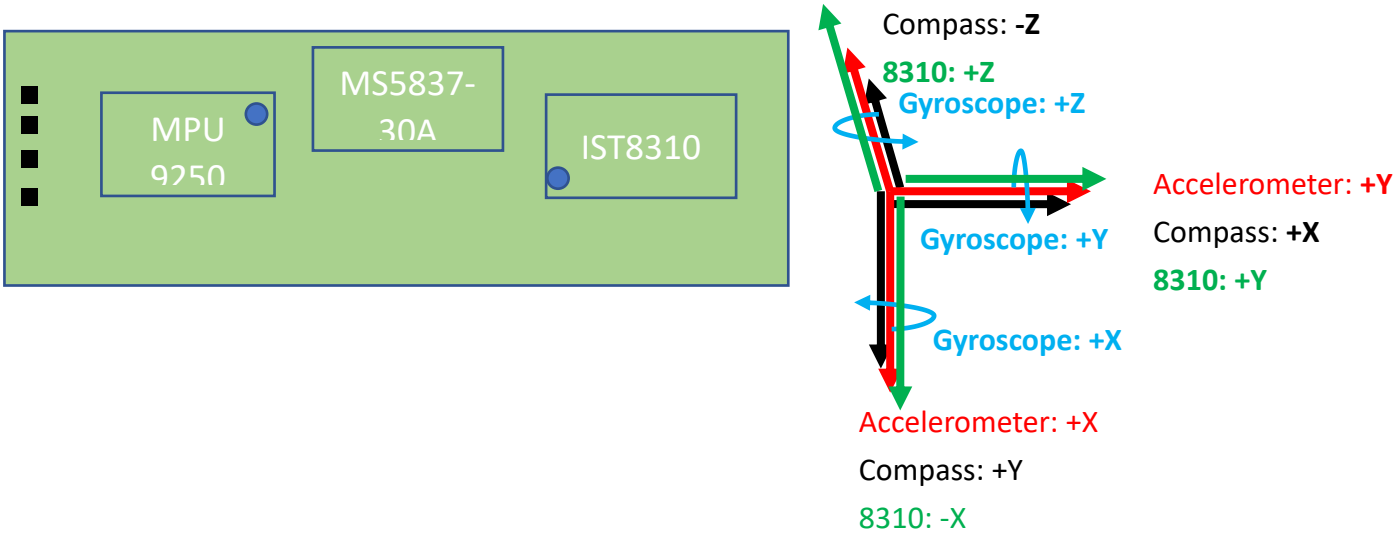
The Mazu Board: **Front View**



The Mazu Board: **Back View**

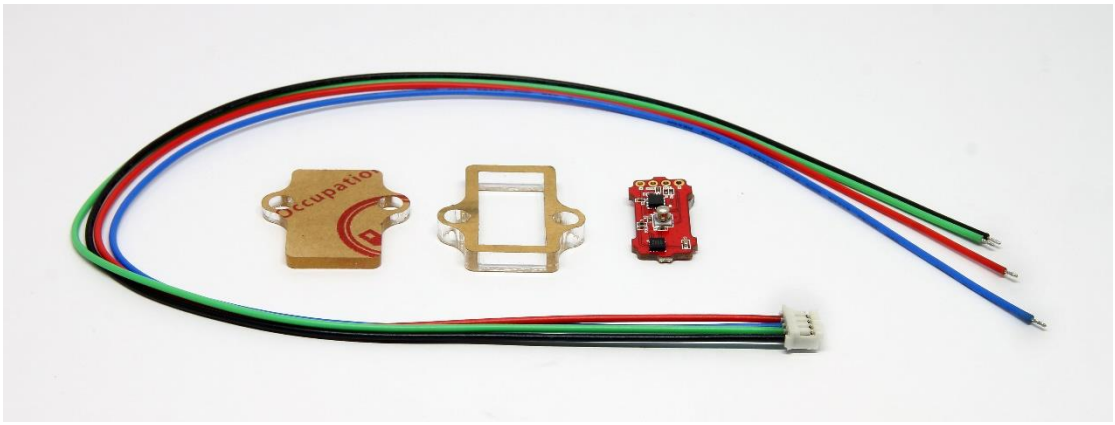
Axes Orientation



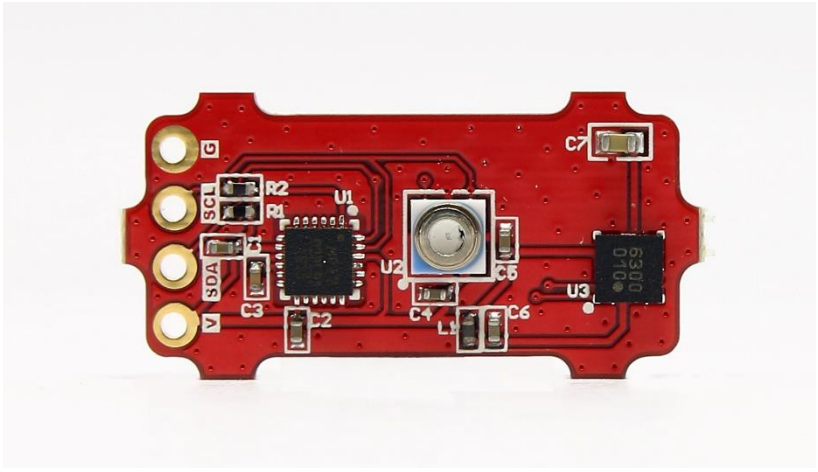


Shipping Package

Entire Package

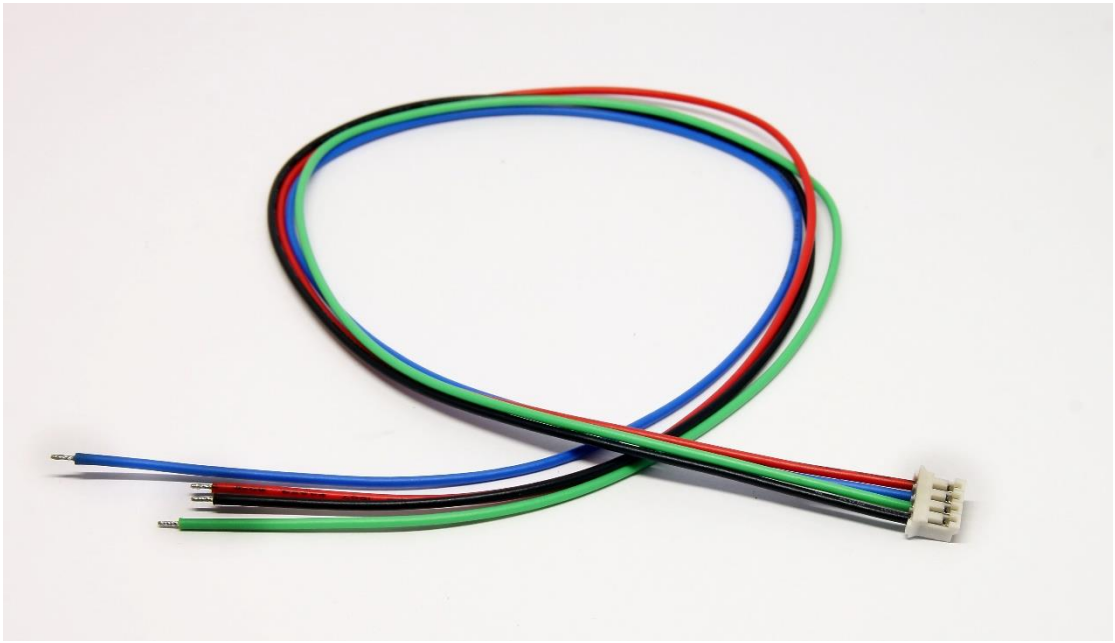


1 x Mazu Board



1 x Acrylic holder set

1 x 4-pin cable



Application: ROV Navigation

The Mazu sensor board is adopted in Voyager II. It provides the following navigation information.

- Yaw/Roll/Pitch motion
- Underwater depth/Temperature
- Compass information

The ROV motion underwater is indicated through the yaw/roll/pitch dimensions. Since scenes underwater are relatively monotonous compared with those on land, it can be difficult to figure out the dimensions of an ROV. Voyager II employs an icon of a 3-D animation submarine to display its motion underwater based on the yaw/roll/pitch data calculated from MPU-9250A (IMU) raw data.

The information about water depth is displayed in the cockpit for the operator's reference. In the meantime, the information is also used as automatic depth control.

Water temperature is important hydrographic data, which offers not only the changing temperature in the surrounding voyage route but also the connection between the water temperature and water depth. The link can be of great assistance for monitoring water resources.

Software Driver

The link is the open source code of the Mazu Sensor board. It includes the driver of MPU-9250A(IMU), MS5837-30BA and IST8310(eCompass) on 7621A platform and the sample code to access the driver.

Please note that

- the I2C driver should be modified to meet your native platform and you might need to modify other codes to build them successfully with your tool chain.

- the sample code to access the driver is devoted to running on the ROV baroque board and you need to modify it to your platform.

- the IST8301 driver is not open and we can only provide the object code due to the policy of the IC manufacturer. Users might have to provide ROV MAKER with their tool chains and compiler flags to get the dedicated lib.

Ordering Information

- Please refer to the Link for individual purchases.
- For bulk purchasing or retailing in Taiwan, please contact us at rovmaker@rovmaker.com for more purchasing and contact information.

Recommended Operation Conditions

Parameters	***Min***	***Typ.***	***Max***	***Unit***
Supply Voltage	2.4	3.3	3.6	V
Temperature	-20	27	85	ºC

I2C Interface

MPU-9250A Slave Address (0x68)

Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	1	0	1	0	0	0

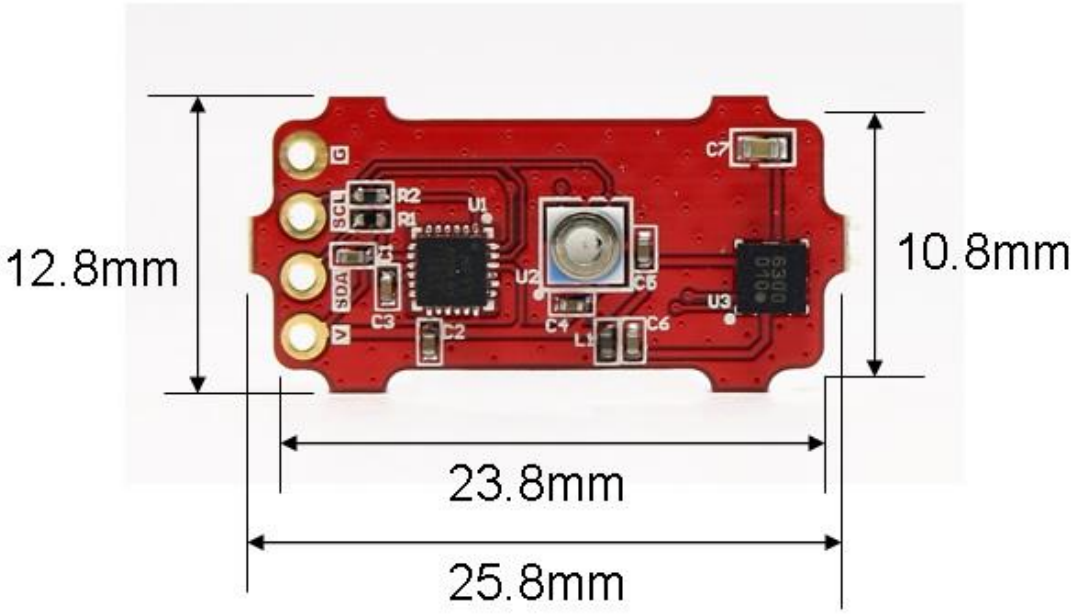
IST8310 Slave Address (0x0C)

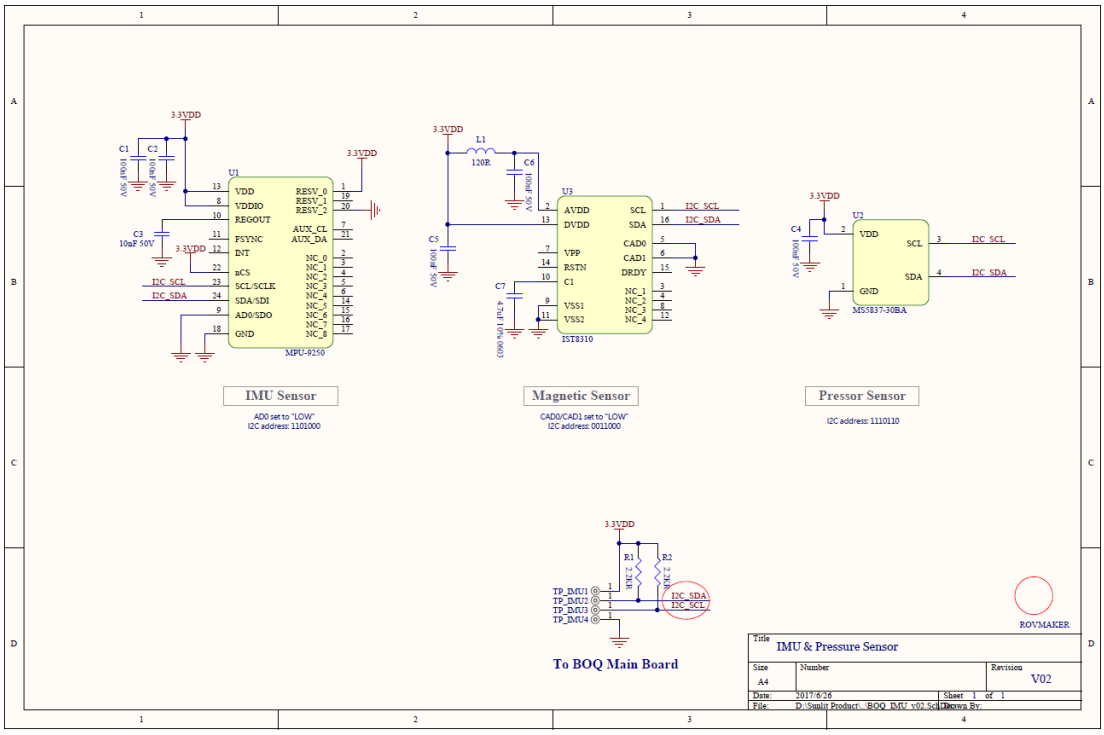
Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	1	1	0	0

MS5837-30BA Slave Address (0x76)

Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	1	1	0	1	1	0

Mechanical Information



Electronic Schematic

The information regarding Schematic of the ESC Board is available through this link or diagrams below: