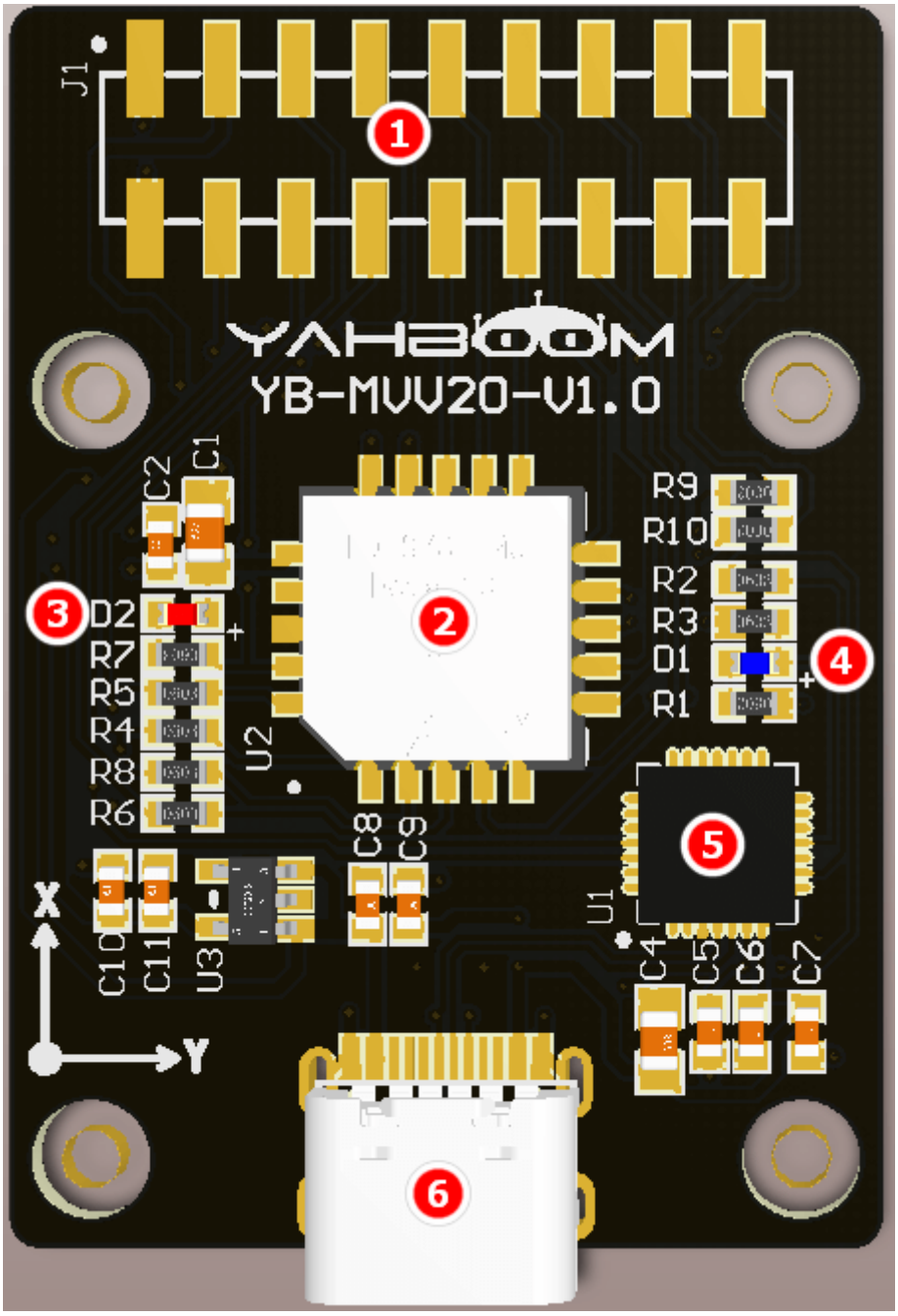
Introduction to Inertial Navigation Module

The Inertial Navigation Module series is a complete set of industrial-grade micro-inertial navigation systems based on mems. This series includes IMU, VRS, AHRS solutions, which can be used for surface mounting and reinforced packaging. It adopts the industry's advanced nonlinear data fusion algorithm. After professional calibration and error compensation, sensor error compensation can be performed online. The ability to interfere with magnetic fields is ideal for areas where cost and size are constrained.

1. Front of inertial navigation module



①: External pins of the inertial navigation module, the specific functions are marked with silk screen on the back of the inertial navigation module.

②: The core component of the inertial navigation module, all calculated poses are processed by this core.

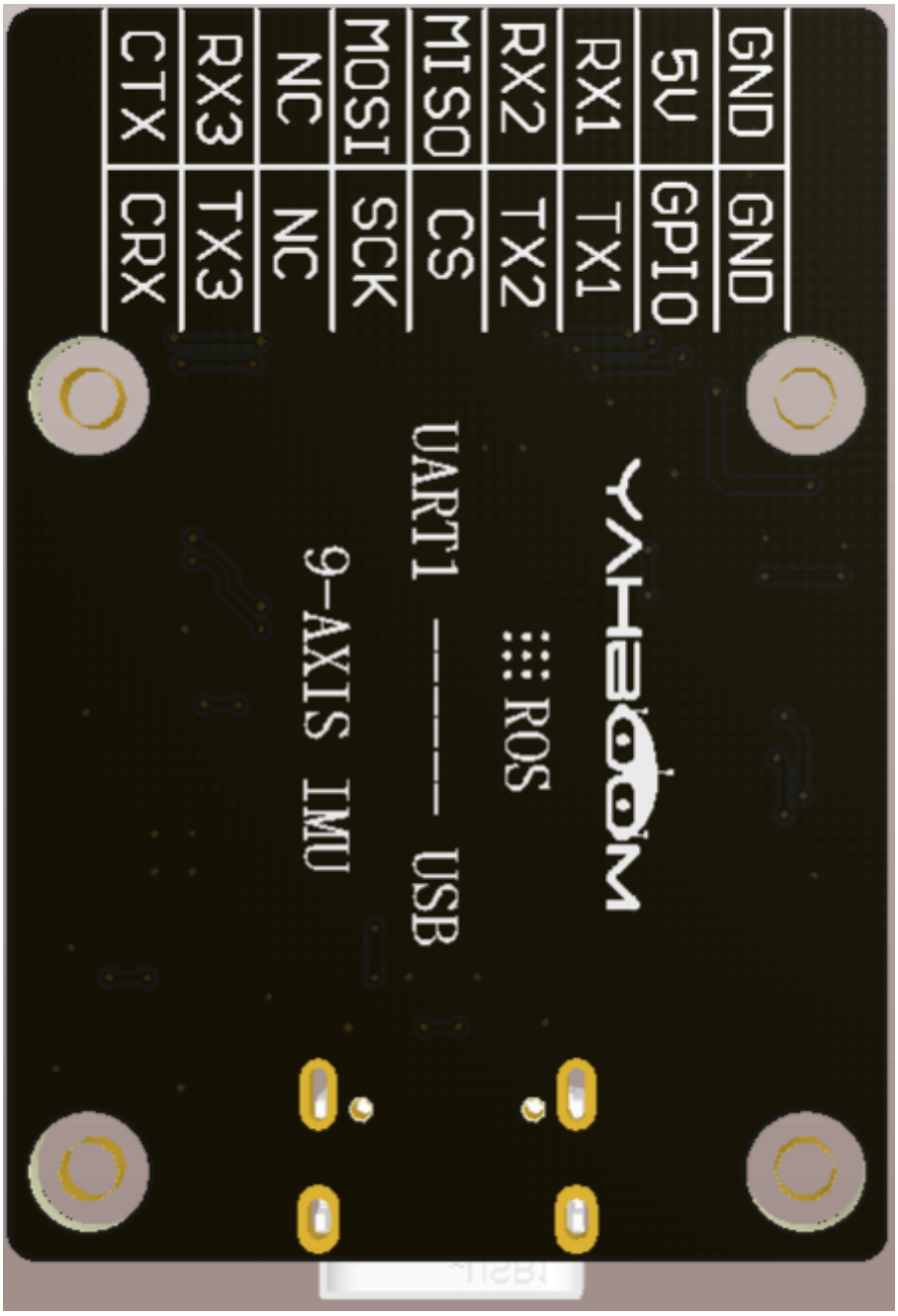
③: D2 indicator: the inertial navigation module status indicator, the module is always on under normal conditions.

④: D1 indicator: CP2102 status indicator, the USB is on during communication, and off when idle.

⑤: CP2102 chip: USB to serial port function.

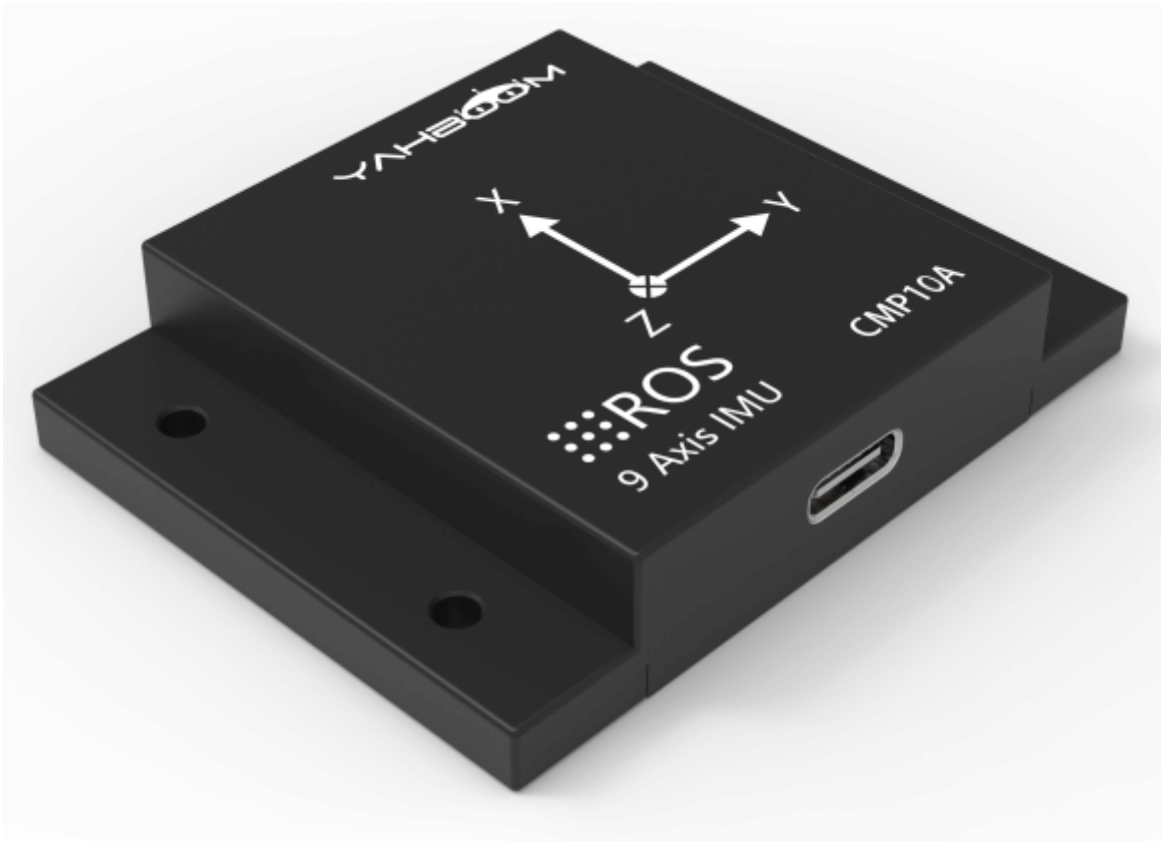
⑥: Type-C interface: connected to serial port 1 of the inertial navigation module, used as a communication interface.

2. the back of the inertial navigation module



3. version difference

The inertial navigation module is divided into a bare metal version and a version with a metal shell. The metal shell version has a shell installed at the factory. The metal shell version can only use USB communication, and the bare metal version can be connected to STM32 and other microcontrollers.



4. product features

Features

- Ultra-small size & standard PLCC20 package supports SMT process
- Stable angle output, heading 0.5°RMS, attitude 0.1°RMS
- Typical gyro bias stability 5°/hr
- Zero offset, scale factor, orthogonality factory calibration

- Conical rowing compensation, adaptive SPKF
- Serial TTL, SPI & CAN communication interface
- 9.5mm×9.5mm×2.5mm , < 1 g
- ITAR-free

Magnetic absolute heading, pitch & roll

- 360° stable and continuous angle output
- Sensor calibration and error compensation
- Outlier detection measurement anomaly isolation
- Offline/Online 3D, 2D Soft Magnetic Hard Magnetic Calibration
- Magnetic anomaly detection, structured magnetic field adaptation, adaptive Sigma nonlinear Kalman filter
- Temperature online tracking

5. performance specifications

Content	Parameter
Pitch/Roll (Static)	0.05°RMS
Pitch/Roll (Dynamic)	0.1°RMS
Relative Heading (Static)	-
Relative Heading (Dynamic)	-
Absolute Heading (Mag Aid)	0.5°RMS
Horizontal Position	-
Speed Accuracy	±0.05m/s
Angular Resolution	<0.01°
Angular Repeatability	<0.1°
IMU data output frequency	200Hz
Navigation data output frequency	100Hz

IMU	Accelerometer	Gyro	Magnetometer
Range	±16 g	±2000 °/s	±4900uT
Zero Bias Stability	< 0.04 mg	< 10 °/hr (5 °/hr typ.)	-
Linearity	< 0.1 % FS	< 0.1 % FS	< 0.1 %
Noise Density	75μg/√Hz	0.0028°/s /√Hz	140 μGauss/√Hz
Bandwidth	260 Hz	256 Hz	200 Hz
Orthogonality Error	±0.05 °	±0.05 °	±0.05 °
Resolution	< 0.5 mg	< 0.02 °/s	1.5 Milligauss

Port	
Port	Serial TTL, SPI& CAN（外置驱动芯片）

Environment	
Operating Temperature	-40°C to +85°C

Input/Output

Protocol	
Output Data	Euler Angles (Yaw, Pitch, Roll); Quaternion; Position; Velocity; Direction Cosine Matrix;
	acceleration, angular velocity, magnetic field vector
Fusion Engine	Adaptive nonlinear Sigma point Kalman filter; user-configurable auxiliary observation source parameter online estimation;
	Outlier and Anomaly Detection Isolation; Adaptive Filtering
External Assistance	GNSS, GNSS, GNSS (Barometer, Airspeed Tube, Odometer)
Instruction Configuration	Support serial command configuration: reboot, calibration, mode switching, etc.
Data Synchronization	Sync-In, Sync-Out I/O pins; GPS PPS, 30 ns RMS, 60 ns 99%