FORSENSE
原极科技

Tactical-grade MEMS 6-DOF inertial sensor

FSS-IMU618-C

Product manual



Forsense (Shanghai) Technology Co., Ltd

Please read this user manual carefully before using this product.

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Tactical-grade MEMS 6-DOF inertial sensor

FSS-IMU618-C-Product Manual(en)

Features

Tactical-grade MEMS Gyroscope

- 0. 6°/hr Bias instability
- xy: 0.09, Z-Axis0.05°/√hr Angle Random Walk
- 0.025°/s Temperature Drift (-40~85°C, <=1°C/min @1σ)

Tactical-Grade MEMS Accelerometer

- 10μg Bias instability
- 0.015m/s/√hr Velocity Random Walk
- X-axis1.5, Y/Z-axis 0.5mg Temperature Drift (-40~85°C, <=1°C/min @1σ)

Wide-range refined temperature compensation

- -40°C to 85°C Temperature Compensation
- Fine-grained Temperature Calibration

independent rotary table calibration

- Independent Calibration of Each Module: Sensitivity, Bias, Misalignment
- User Interface for Installation Error Calibration

High-strength Operating Condition Tolerance

- Extreme Shock Resistance: 2000g (0.5ms, Half-sine, 3-axis)
- Superior Vibration Resistance: 10g (10~2kHz, 3-axis)
- Stable Operation Across Full Temperature Range: -40°C ~ 85°C
- 100% Magnetic Shielding

Real-time and Flexible Digital Interface, Compact Size

- Up to1kHz Configurable Output Sample Rate
- Supports Serial Port, I2C, and SPI interfaces
- 23.7*23.7*9.9mm, weight only 10g

Product Overview

IMU618-CIt is a 6 degrees of freedom (DOF) MEMS inertial sensor module developed by Forsense Technology. It outputs three-axis Gyroscope and acceleration information as standard.

High precision and high resolution enable the capture of subtle vibrations and tilts. The wide-range output makes motion perception possible under large dynamic conditions. All modules undergo fine-grained temperature compensation across an ultra-wide temperature range and independent calibration before shipment, ensuring stable performance under various extreme operating conditions while maintaining high consistency in product performance.

Application Areas

- Autonomous Driving: Automotive, Robotics, Engineering Vehicles, Underwater
- Precision Measurement: Downhole, Tunnels, Vibration, Tilt
- Stabilized Platform: Pan tilt, Satellite Communication on the Move (Satcom on the Move),
- Navigation Control: Automation System, Fixed-wing UAV

Based on standard performance and output Parameter, Forsense also provides for your special needs**Customized Software and Logo Customization Services**, to support you in product integration!

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1. Parameter Performance

1.1 Gyroscope Key Metrics

Table 1 Gyroscope Key Metrics

Parameter	Test Conditions/Remarks	Min	Typ	Max	Unit
Measurement Range			±500		°/s
Bias instability[3]	@25℃, Allan Variance, 1σ		0.6		°/hr
Bias stability	GJB, 10s Smoothing		2		°/hr
Bias Repeatability	GJB		10		°/hr
Resolution			0.0062		°/s
Misalignment between axes			0.02		deg
Internal low-pass cutoff frequency	Software Adjustable		58		Hz
Sample Rate[1]			1000		Hz
measure delay			7.0		ms
Bias over temperature[2]	-40℃ ~ 85℃, ≤1℃/min @1σ		0.025		°/s
Random Walk[3]	@25℃, Allan Variance, 1σ		xy:0.09 z:0.05		°/√hr
scale coefficient error			xy:2 z:1.5		‰
scale factor nonlinear			50		ppm

Note 1: Limited by Serial Port Bandwidth, if serial port baud rate is set to 115200, the maximum output frequency is 100Hz

Note 2: The 1σ variation of Bias over the full temperature range at a heating rate of 1°C/min

Note 3: IEEE standard, provided by the Allan variance curve in a static environment at 25°C

1.2 Accelerometer Key Metrics

Table 2 Accelerometer Key Metrics

Parameter	Test Conditions/Notes	Min	Typical	Max	Unit
Measurement Range			±8		g
Bias instability[3]	@25℃, Allan Variance, 1σ		10		μg
Bias stability	GJB, 10s Smoothing		x:50 yz: 20		μg
Bias Repeatability	GJB		x:0.6 yz:0.2		mg
Resolution			0.0863		mg
Misalignment between axes			0.02		deg
Internal low-pass cutoff frequency	Software Adjustable		58		Hz
Sample Rate[1]			1000		Hz
measure delay			7.0		ms
Bias over temperature[2]	-40℃ ~ 85℃, ≤1℃/min @1σ		x:1.5 yz:0.5		mg
Random Walk[3]	@25℃, Allan Variance, 1σ		0.015		m/s/√hr
scale coefficient error			0.5		‰
scale factor nonlinear			100		ppm

Note 1:Limited by Serial Port and Bandwidth, if serial port baud rate is set to 115200, the maximum output frequency is 100Hz

Note 2: 1σ value of Bias variation over the full temperature range at a heating rate of 1°C/min

Note 3: Based on IEEE standard, derived from Allan variance curve in static environment at 25°C

Figure 1 Typical Gyroscope Allan Variance Curve

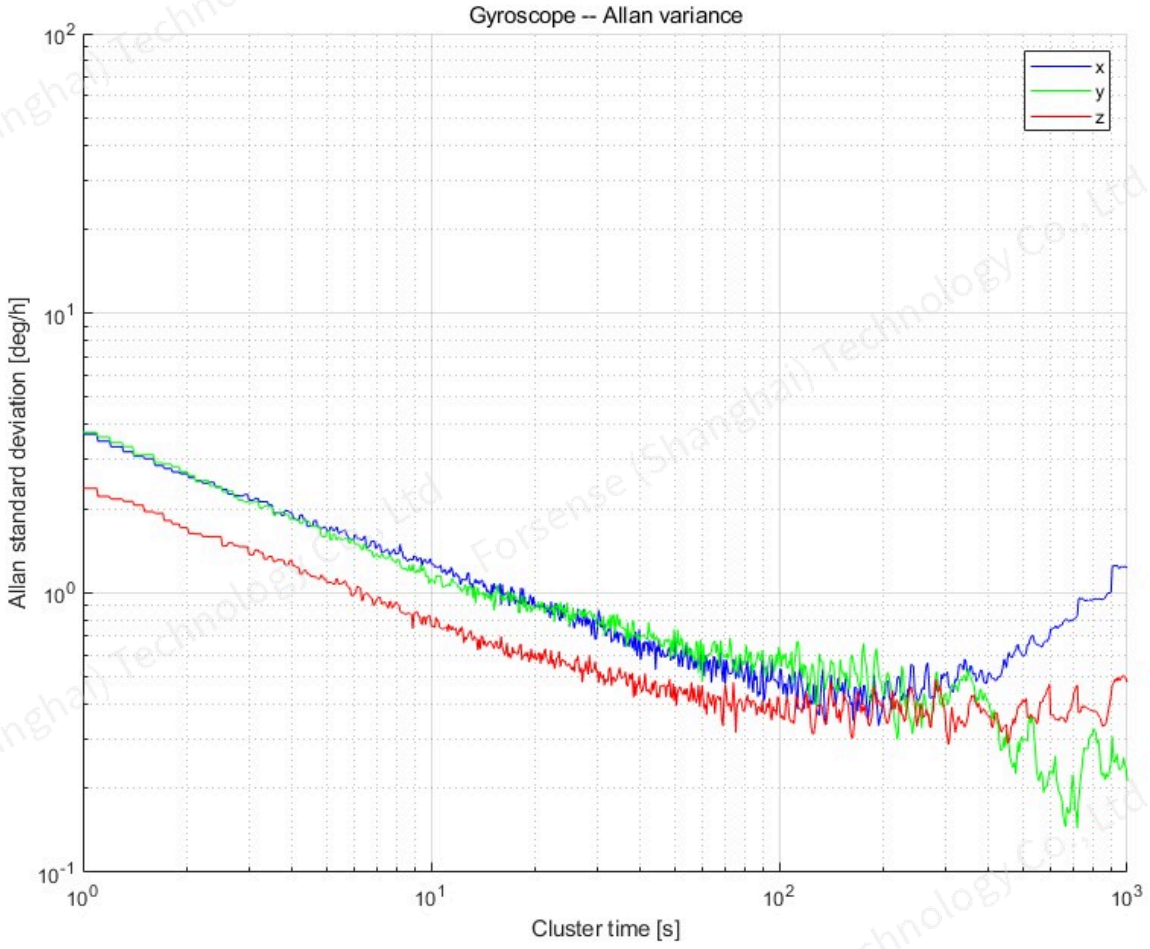
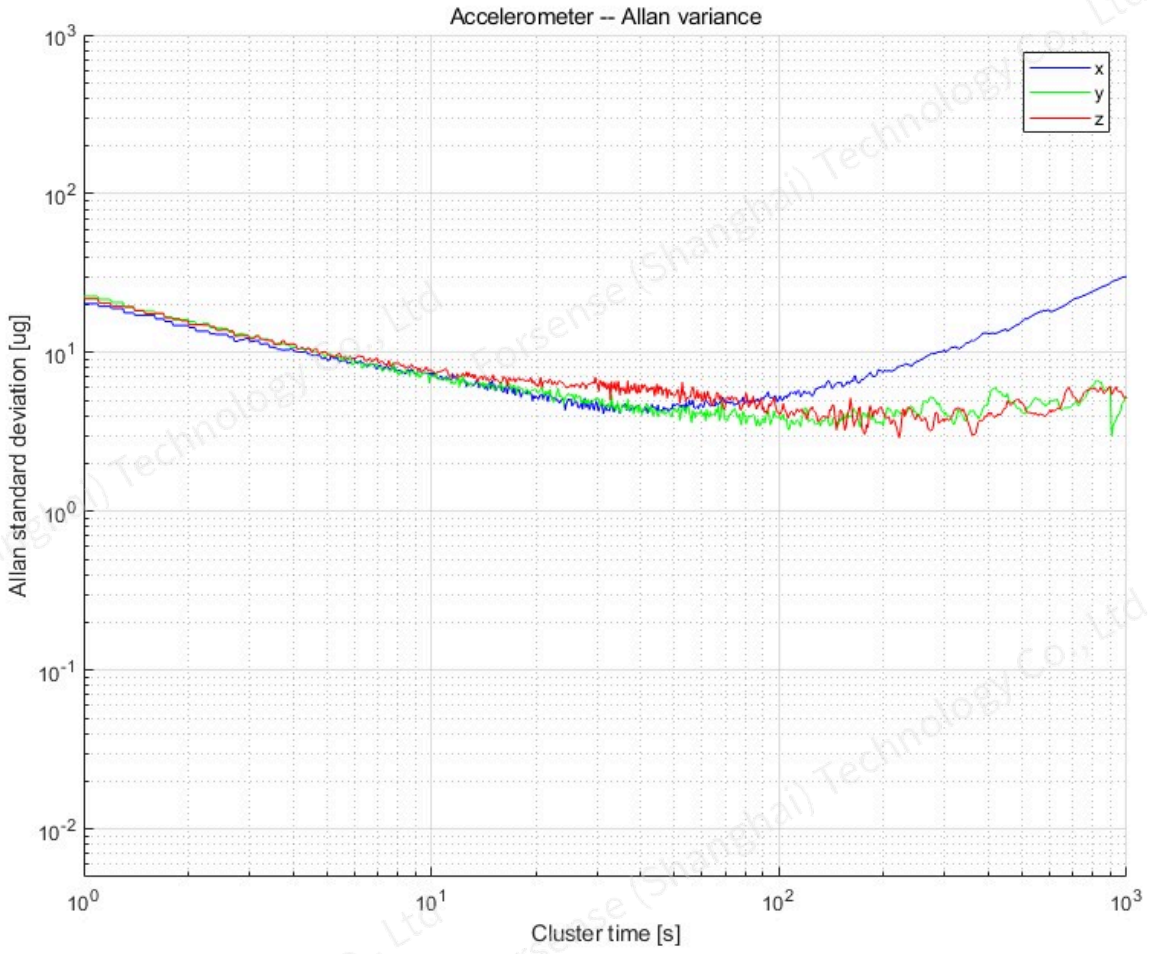


Figure 2 Typical Accelerometer Allan Variance Curve


Accelerometer -- Allan variance
Allan standard deviation [ug]
Cluster time [s]
x
y
z
10^3
10^2
10^1
10^0
10^-1
10^-2
10^0
10^1
10^2
10^3

2. Outline Structure

Figure 3 Outline Structure and Dimensions (Unit: mm)

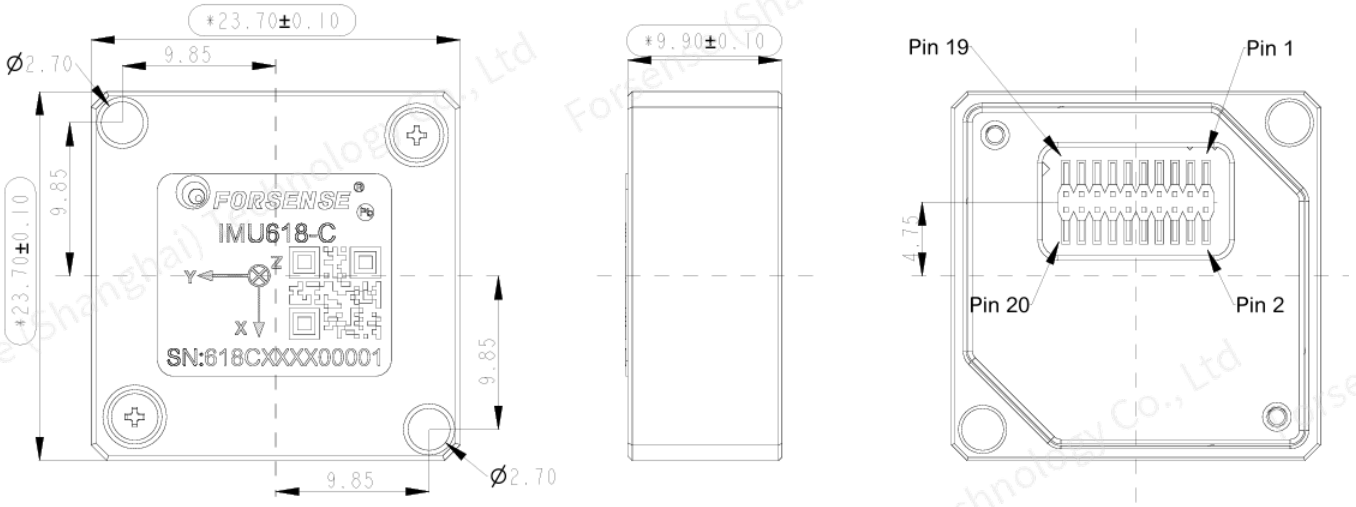


Figure 4 IMU Measurement Center Location (Unit: mm)

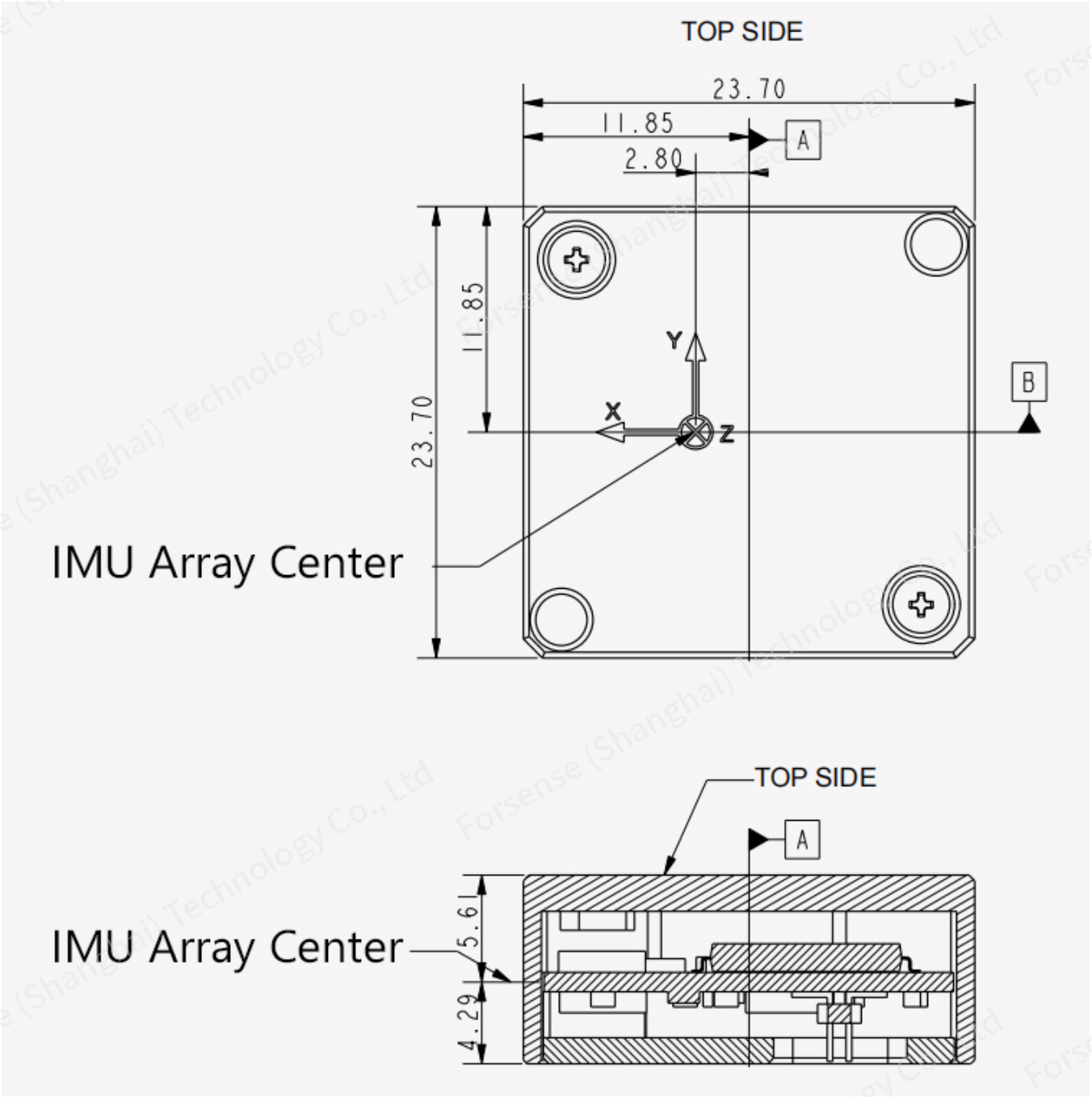
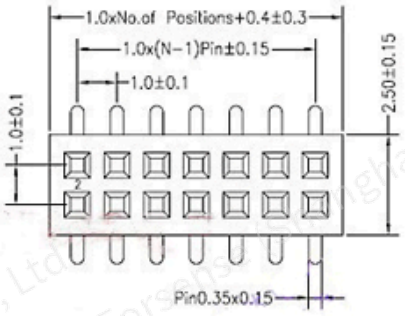


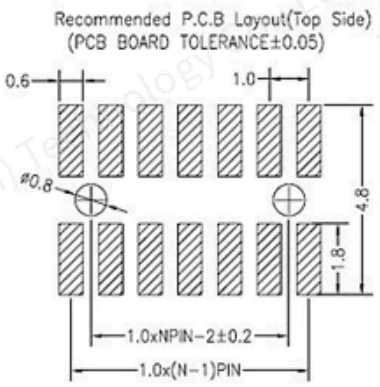
Figure 5 Reference Socket Header Specifications and Dimensions (Unit: mm)

HSF RoHS

SPECIFICATIONS
Rated Current:0.75AMP
Contact Resistance:30mΩ Max
Withstand Voltage:500V AC/DC
Insulation Resistance:1000MΩ Min
Operation Temperature:-40°c to +105°c

Contact Material:Phosphor Bronze
Contact Plating:Au or Sn Over Ni
Insulator Material:Polyester(UL94V-0)
Standard: PA6T
Max.Processing Temp: 230°C for 30-60 seconds
(260°C for 10 seconds)

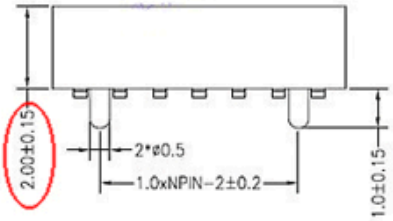


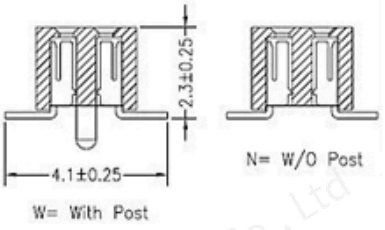


Ordering Information

2620 02 XX X X XX M U X 01

No.of Pins Per Row	Insulator Material Option	Post	Contact Plating	Packing
2*50	A=BK-PBT B=BK-PA66 C=BK-PA6T D=BK-PA46 E=BK-PA9T F=BK-LCP	W=With Post N=W/O Post	G0:Gold Flash G2:5u" Gold G3:10u" Gold G4:15u" Gold G5:30u" Gold S0:Gold Flash/Tin SN:Tin	T=Tube P=Tube+Cap R=Reel+Cap M=Reel+Mylar





3. Electrical Characteristics

3.1 Maximum Ratings

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Range	Unit
supply voltage	VCC	-0.3 to 4	V
Ground (GND)	GND	-	-
Input Pin Voltage (Vin)	Vin	-0.3 to VCC+0.2	V
Operating Temperature (Tot)	Tot	-40 to 85	℃
Storage Temperature (Tstg)	Tstg	-40 to 85	℃

3.2 Operating Conditions

Table 4 Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
supply voltage	VCC	3.2	3.3	3.4	V
VCC Max Ripple	Vrpp		±40		mV
Power Consumption	P		0.09		W
Operating Temperature (Tot)	Tot	-40		85	℃
Storage Temperature (Tstg)	Tstg	-40		85	℃

3.3 IO Threshold Characteristics

Table 5 IO Threshold Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Input Pin Low Level	Vin_low	0		VCC*0.2	V
Input Pin High Level	Vin_high	VCC*0.7		VCC+0.2	V
Output Pin Low power level	Vout_low	0		0.45	V
Output Pin High power level	Vout_high	VCC-0.45		VCC	V

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4. Pin Definition

Figure 6 Pin Schematic

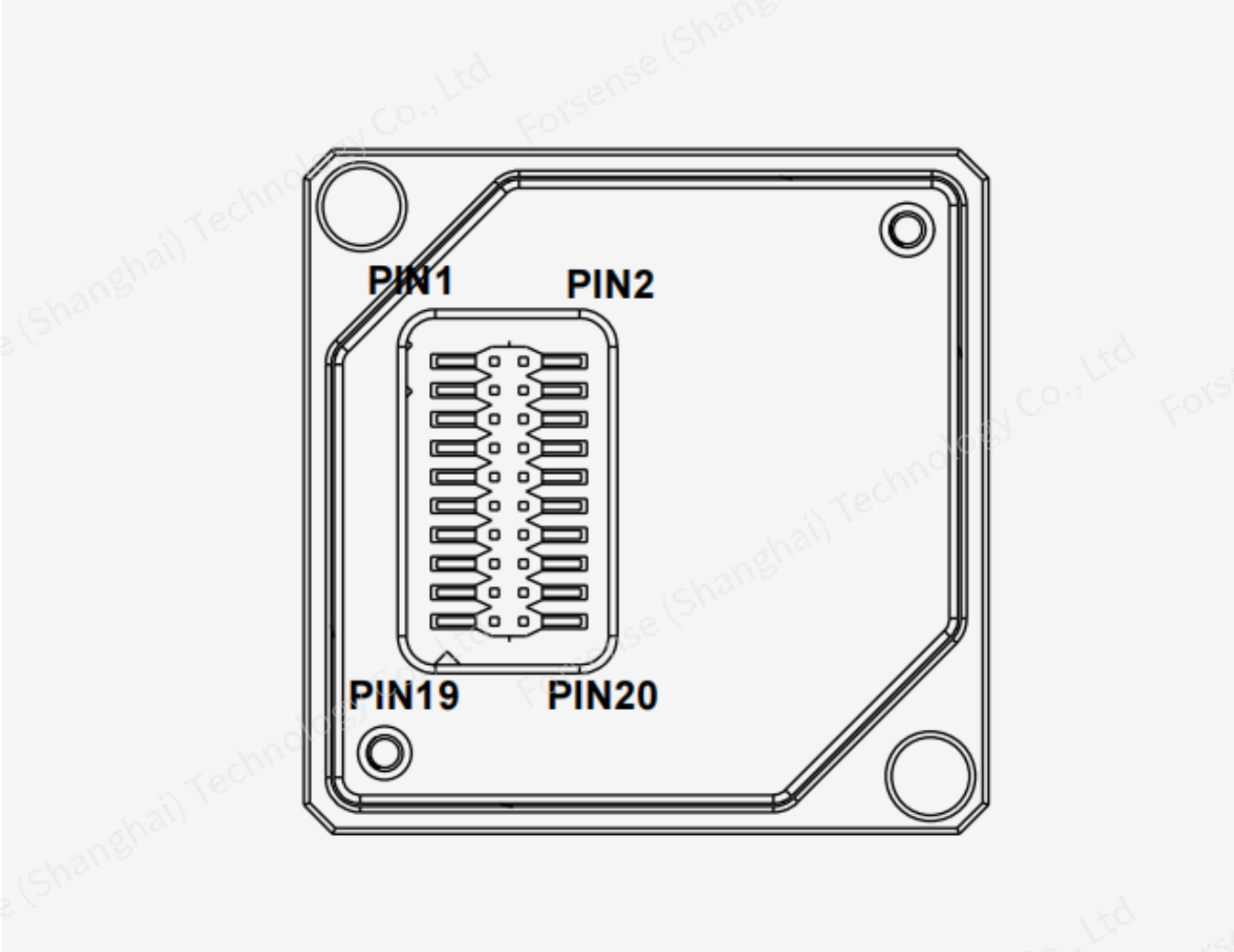


Table 6 Pin Definition

Pin No.	Pin Name	Pin Description
1	SCLK	SPI Clock
2	SDO	SPI Data MISO
3	GND	Ground (GND)
4	GND	Ground (GND)
5	SDI	SPI Data MOSI
6	/CS	SPI chip select
7	TX	Serial Port Output
8	CAN_Tx	CAN Port Transmit, Leave Floating When Not Connected
9	RX	Serial Port Input
10	NC	No Connection
11	VCC	Power Supply Input, +3.3V Input
12	VCC	Power Supply Input, +3.3V Input
13	DRDY/SCL	Data Ready/I2C Clock
14	EXT/SDA	External Trigger Sampling / I2C Data
15	CAN_Rx	CAN Port Receive, Leave Floating When Not Connected
16	/RST	External Hardware Reset Input
17	NC	No Connection
18	NC	No Connection
19	SEL	SPI / I2C Mode Control, Floating or Tied Low power level: SPI, High power level: I2C
20	NC	No Connection

Note 1: When Master initialize, use /RST to reset the IMU hardware once

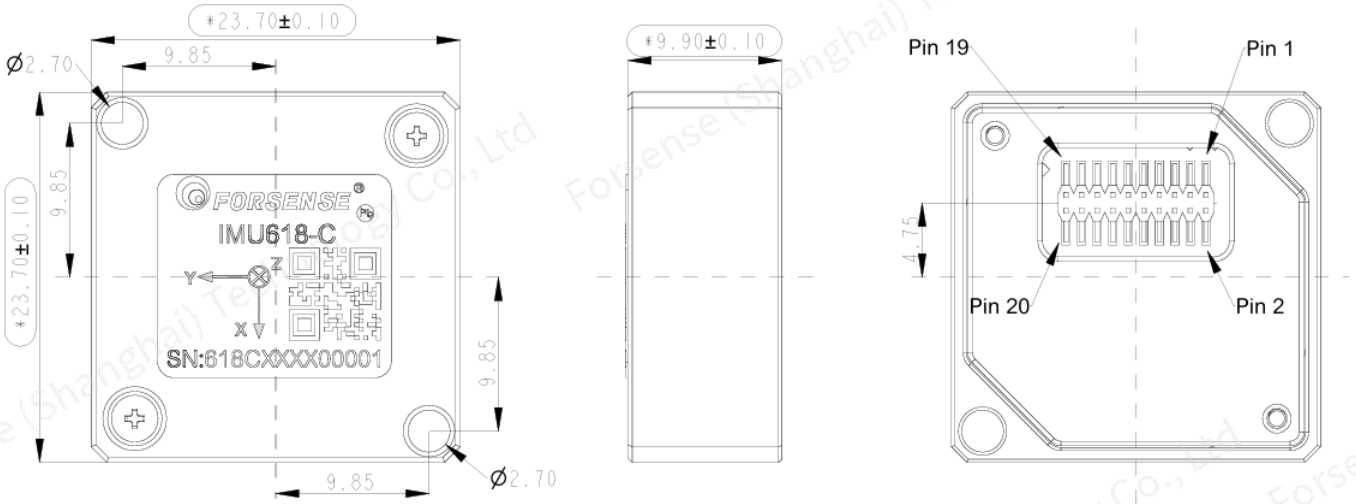
5. Communication Protocol

Reference Document Forsense IMU Communication Protocols（en）

Includes serial communication protocols, coordinate system settings, filter settings, Parameter settings, OTA update methods, time synchronization, etc.

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6. Coordinate SystemDefinition



This product uses the Front-Right-Down (FRD) coordinate system. The Euler angle ranges are as follows:

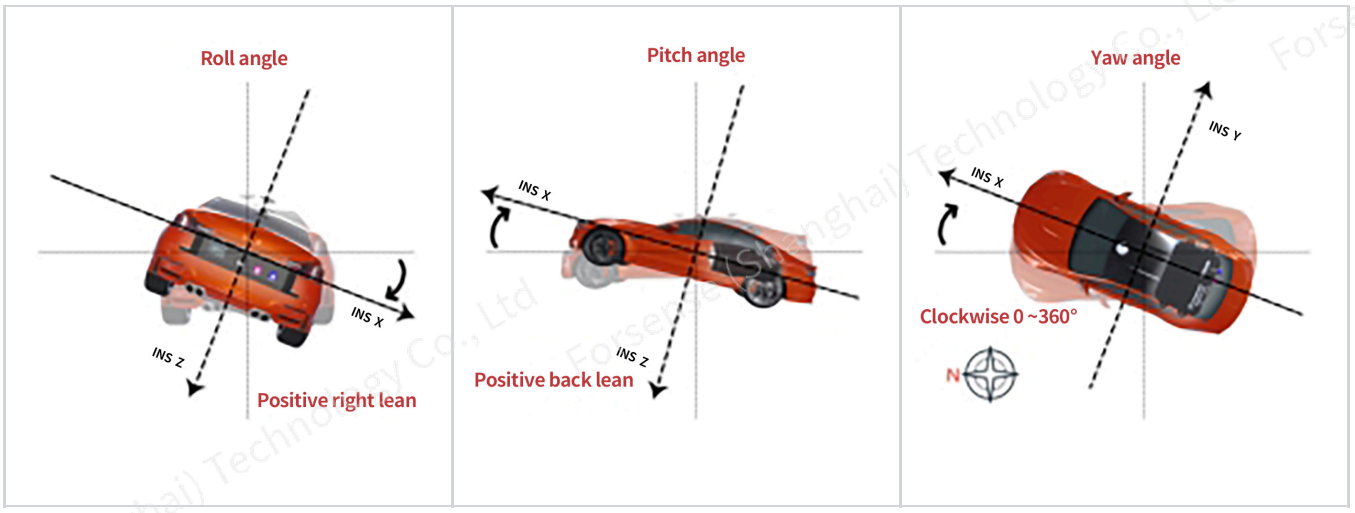
Rotation about the Z-axis: Yaw angle Yaw range: 0° ~ 360°;

Rotation about the X-axis: Roll angle Roll range: -180° ~ 180°;

Rotation about the Y-axis: Pitch angle Pitch range: -90° ~ 90°.

The schematic diagram of Roll, Pitch, and Yaw angle is shown below:

Figure7 Roll, Pitch, Yaw angle Schematic



7. Usage Examples

7.1 Device Installation

1. The module should be securely fixed to a rigid plane, avoiding installation in locations with high vibration.

2. The module's installation orientation should be consistent with the vehicle's forward direction.

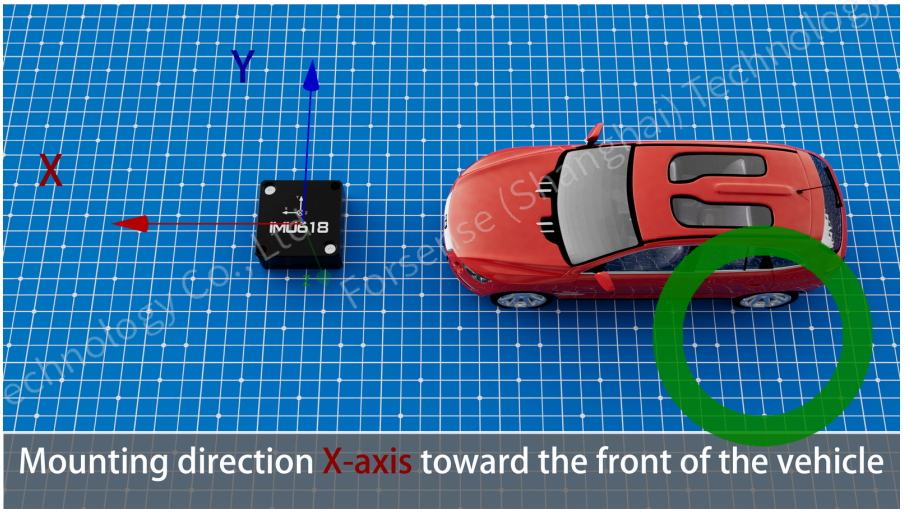
Figure8 Module Installation Diagram



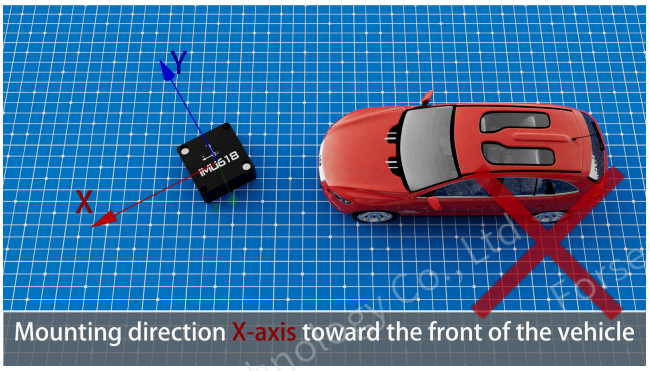
The correct installation diagram is shown below

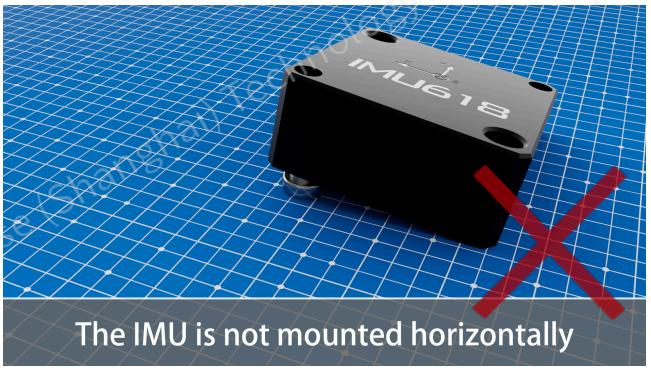
X-axis points toward the front of the vehicle

Figure9 Correct Installation Diagram

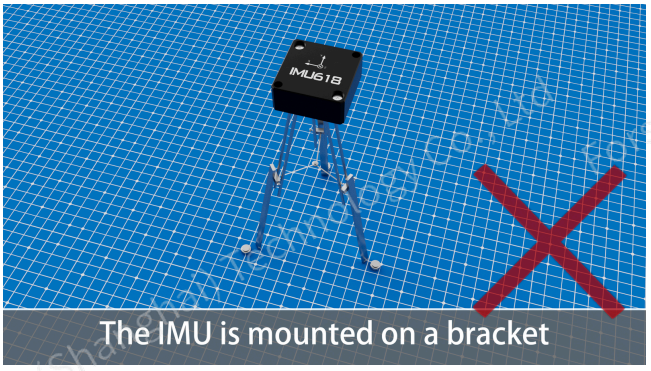


The following installation methods are incorrect.

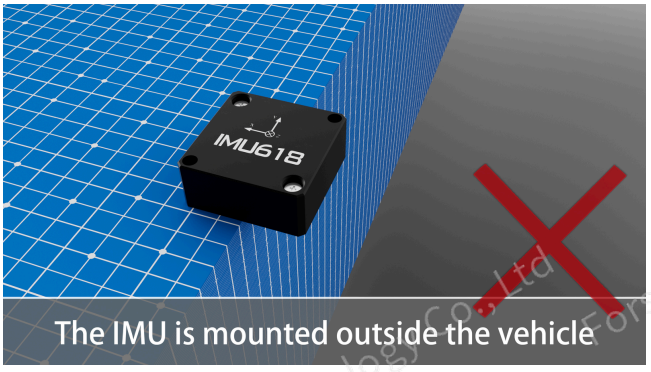






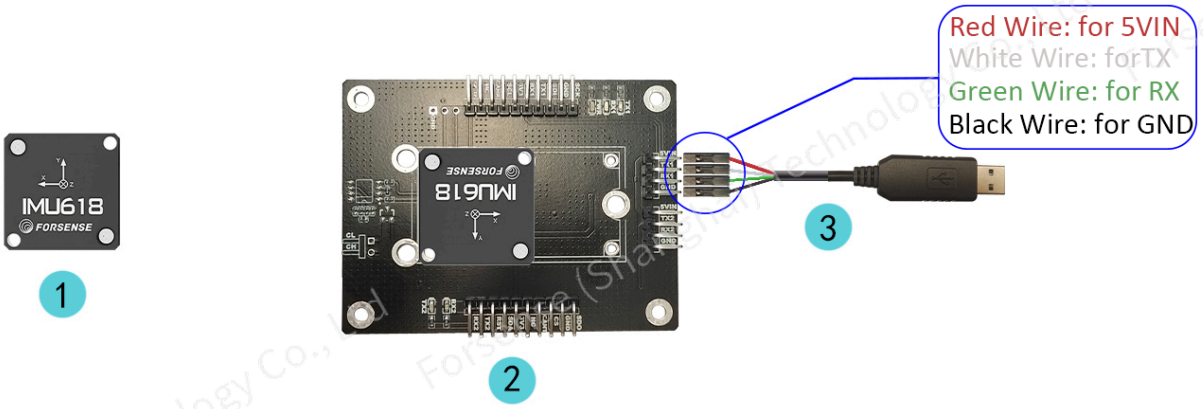






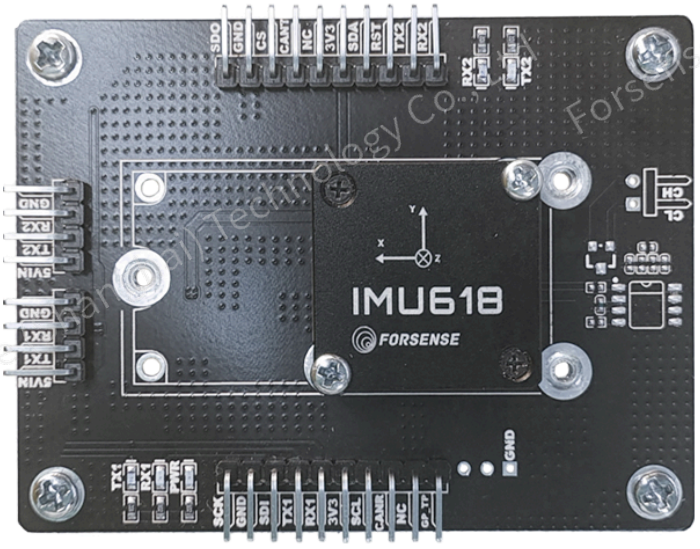
7.2 PC software Connection Example

Figure10 Module Connection PC software Schematic



	Name	Quantity
1	IMU618	1
	Accessories Name	Quantity
2	IMU618 Test Board	1
3	TTL Serial Cable	1

8. OptionalAccessories



IMU618 Base Plate Test



TTL Serial Port Line

9. Update History

Latest Manual Version: IMU618-C_Datasheet_Product Manual(en)

Version	Date	Status/Notes
Version 1.0	2024.03.29	Initial Release
Version 1.1	2024.05.10	Added PC software connection diagram
Version 1.2	2025.01.24	Released
Version 1.3	2025.08.01	Simplified communication protocol

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