FORSENSE
原极科技

Tactical-grade MEMS 6-DOF inertial sensor

FSS-IMU618-H

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-H-Product Manual(en)

Features

Tactical-grade MEMS Gyroscope

- 1°/hr on xy-axis, 0.5°/hr on z-axis Bias instability
- 0.02°/√hr on xy-axis, 0.03°/√hr on z-axis Angle Random Walk
- X/Y Axis0.03°/s, Z Axis 0.01°/sTemperature Drift (-40℃~85℃, ≤1℃/min @1σ)

Tactical-Grade MEMS Accelerometer

- 20μg Bias instability
- 0.035m/s/√hr Velocity Random Walk
- 0.2 mg on xz-axis, y-axis0.4mg Temperature Drift (-40℃~85℃, ≤1℃/min @1σ)

Wide refined temperature compensation Range

- -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-Intensity 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 to100Configurable Output Sampling Rate from 0 Hz
- Supports Serial Port, I2C, and SPI interfaces
- 23.7*23.7*9.9mm, Weight Only 10g

Product Overview

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

High precision and high resolution capture subtle vibrations and tilts. Wide-range output enables motion sensing under large dynamic conditions. All modules undergo fine temperature compensation and independent calibration across an ultra-wide temperature range before shipment, ensuring stable performance under extreme operating conditions and high consistency across all products.

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**customized software and LOGO customization services**, to support your product needs!

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1. Performance Parameter

1.1 Gyroscope Key Specifications

Table 1 Gyroscope Key Specifications

Parameter	Test Conditions / Remarks	Min.	Typ.	Max.	Unit
Measurement Range			±300		°/s
Bias instability[3]	@25℃, Allan Variance, 1σ		XY:1.0 Z:0.5		°/hr
Bias stability	GJB, 10s Smoothing		xy:6.0 z:1.2		°/hr
Bias Repeatability	GJB		xy:5.5 z:1.2		°/hr
Resolution			0.0006		°/s
Misalignment between axes			0.02		deg
Internal low-pass cutoff frequency	Software Adjustable		68		Hz
Sample Rate[1]			100	1000	Hz
measure delay			6		ms
Bias over temperature[2]	-40℃ ~ 85℃, ≤1℃/min @1σ		xy:0.03 z:0.01		°/s
Random Walk[3]	@25℃, Allan Variance, 1σ		xy:0.02 z:0.03		°/√hr
scale coefficient error			1.5		‰
scale factor nonlinear			200		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: 1σ value of full-temperature Bias variation at a heating rate of 1°C/min

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

1.2 Accelerometer Key Specifications

Table 2 Accelerometer Key Specifications

Parameter	Test Conditions / Remarks	Min.	Typ.	Max.	Unit
Measurement Range			±8		g
Bias instability[3]	@25℃, Allan Variance, 1σ		20		μg
Bias stability	GJB, 10s Smoothing		xz:40 y:60		μg
Bias Repeatability	GJB		0.05		mg
Resolution			0.0318		mg
Misalignment between axes			0.02		deg
Internal low-pass cutoff frequency	Software Adjustable		68		Hz
Sampling Rate[1]			100	1000	Hz
measure delay			6		ms
Bias over temperature[2]	-40℃ ~ 85℃, ≤1℃/min @1σ		xz:0.2 y:0.4		mg
Random Walk[3]	@25℃, Allan Variance, 1σ		0.035		m/s/√hr
scale coefficient error			0.5		‰

scale factor nonlinear			100		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: 1σ value of full-temperature Bias variation at a heating rate of 1°C/min

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

Figure 1 Gyroscope Allan Variance Typical Curve

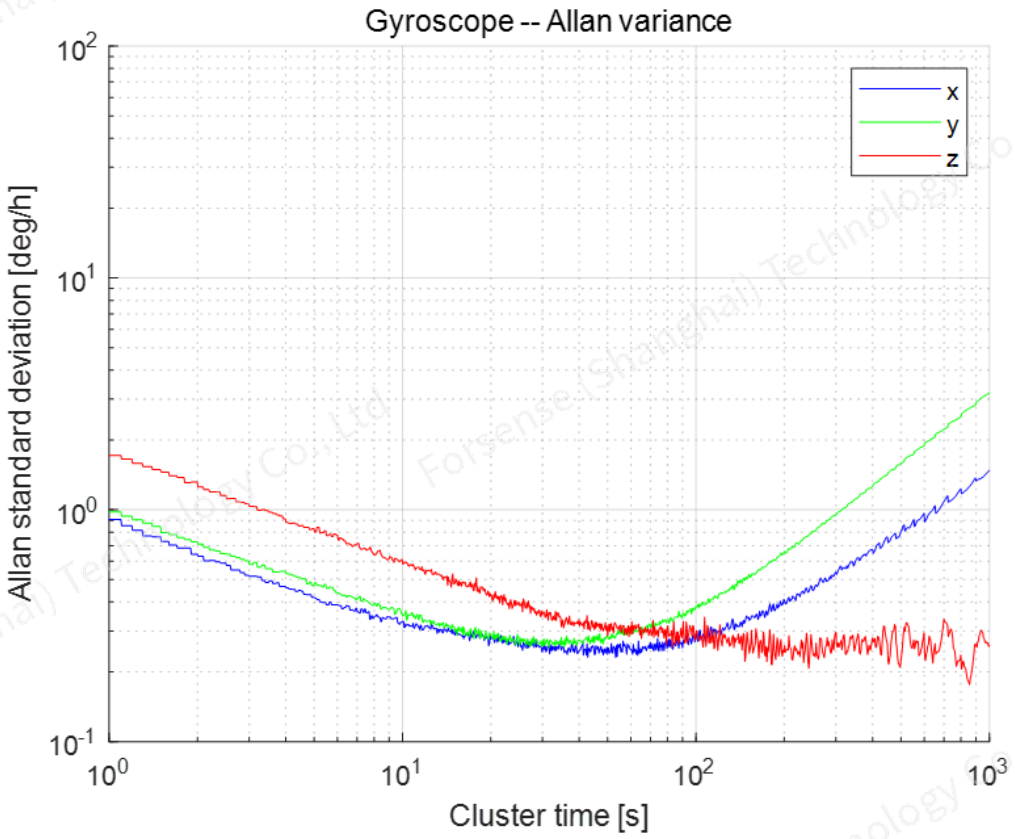
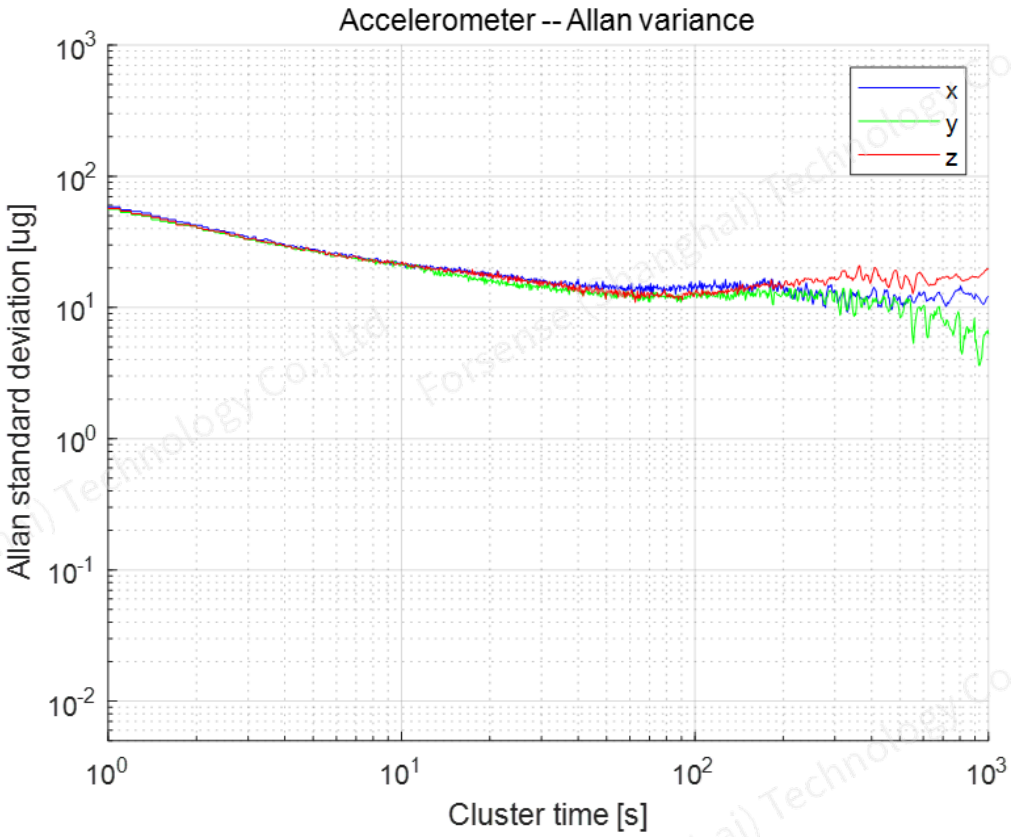


Figure 2 Accelerometer Allan Variance Typical Curve


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. Physical Structure

Figure 3 Outline Structure and Dimensions (Unit: mm)

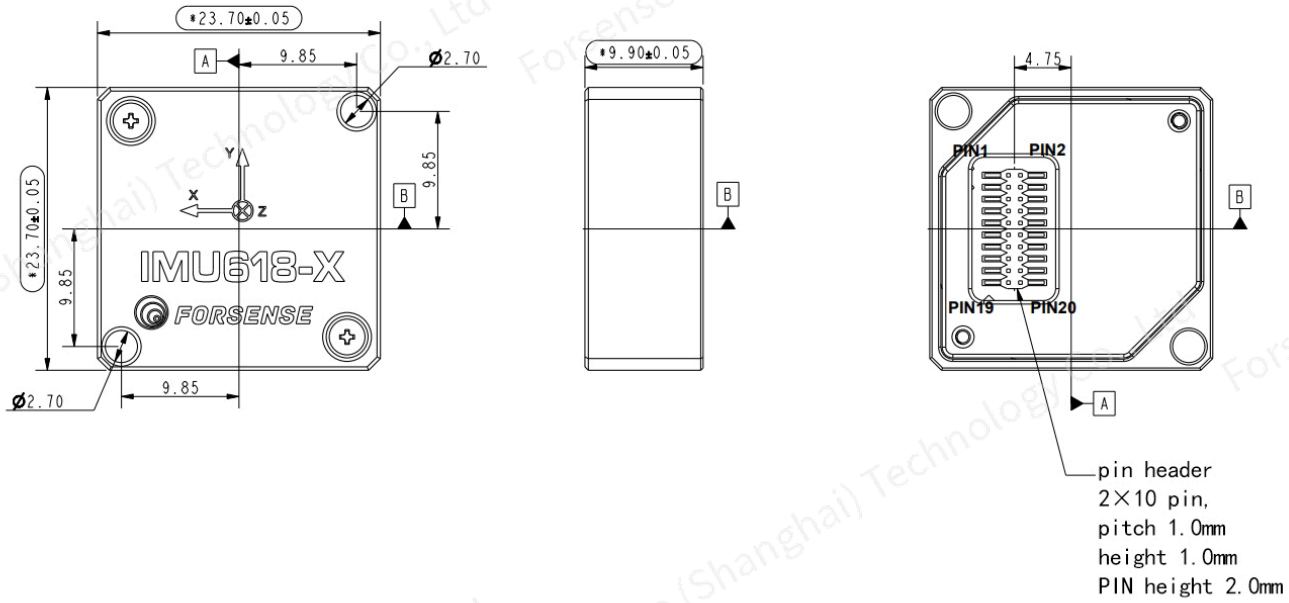


Figure 4 IMU Measurement Center Position Diagram (Unit: mm)

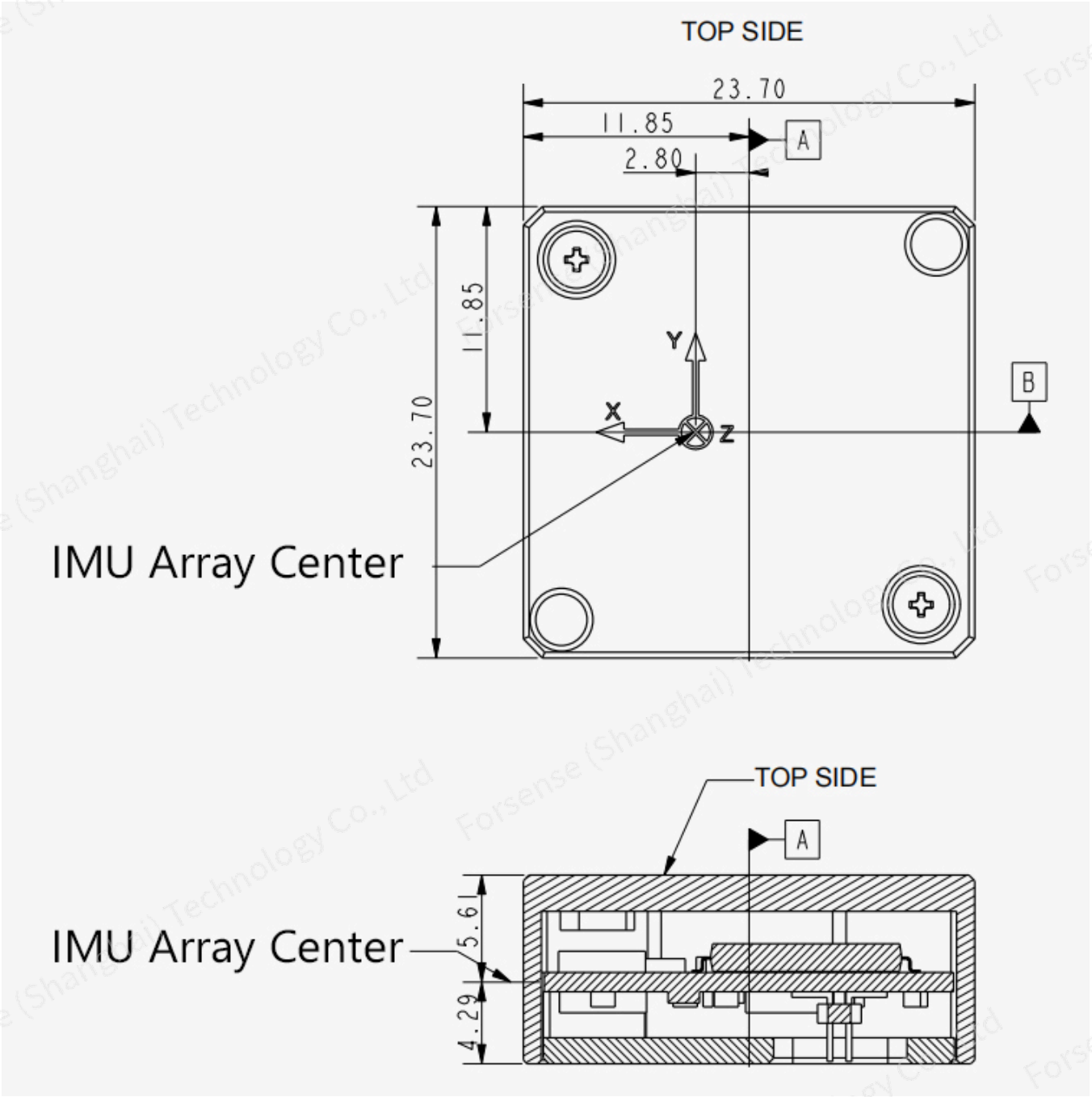
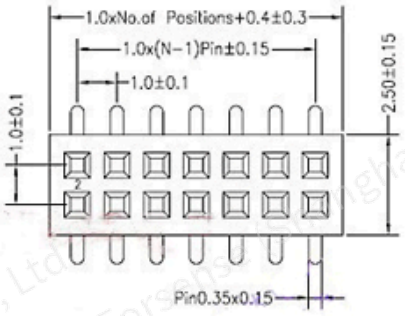


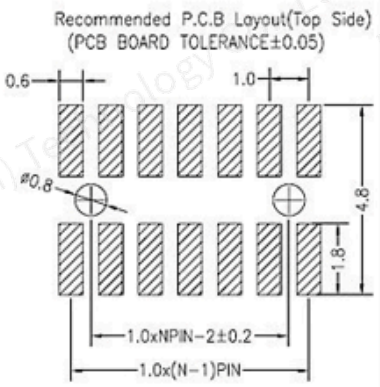
Figure 5 Reference Dimensions of Plug-in Female Header (Unit: mm)

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)

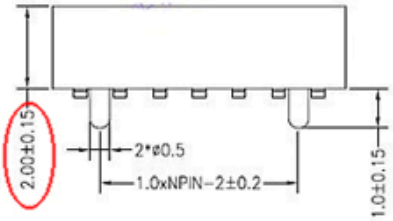


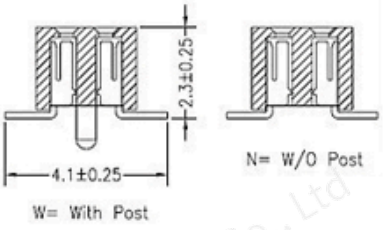


Ordering Information

2620 02 XX X X XX M U X 01

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





3. Electrical Characteristics

3.1 Maximum Tolerance

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Range	Unit
supply voltage	VCC	-0.3 to 4.0	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	Symbols	Min	Typ	Max	Unit
supply voltage	VCC	3.2	3.3	3.4	V
VCC Max Ripple	Vrpp		±40		mV
Power Consumption	P		0.3		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

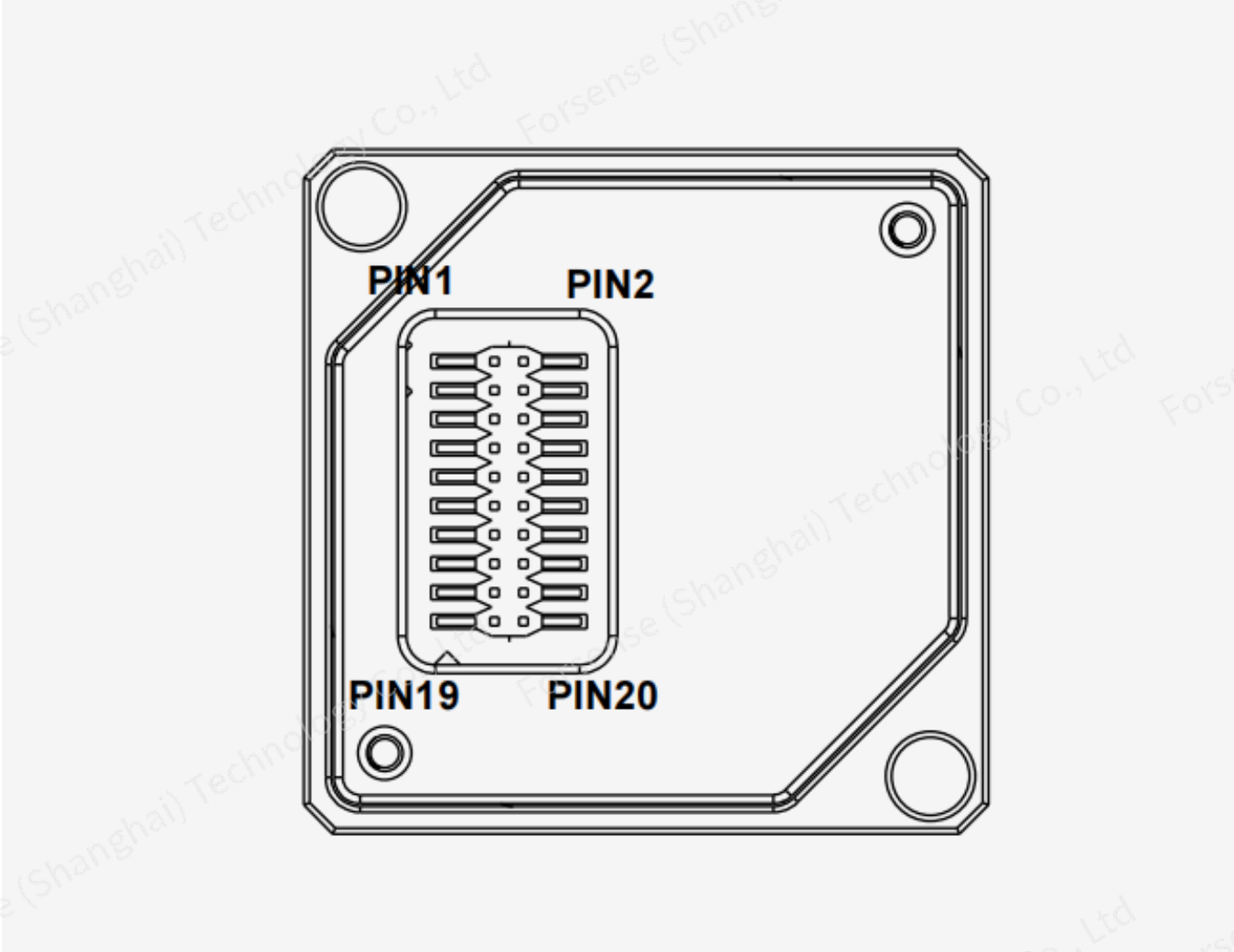


Table 6 Pin Definition

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 Transmission, 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 Low power level: SPI, High power level: I2C
20	NC	No Connection

Note 1: Master initialize requires a hardware reset of the IMU via /RST.

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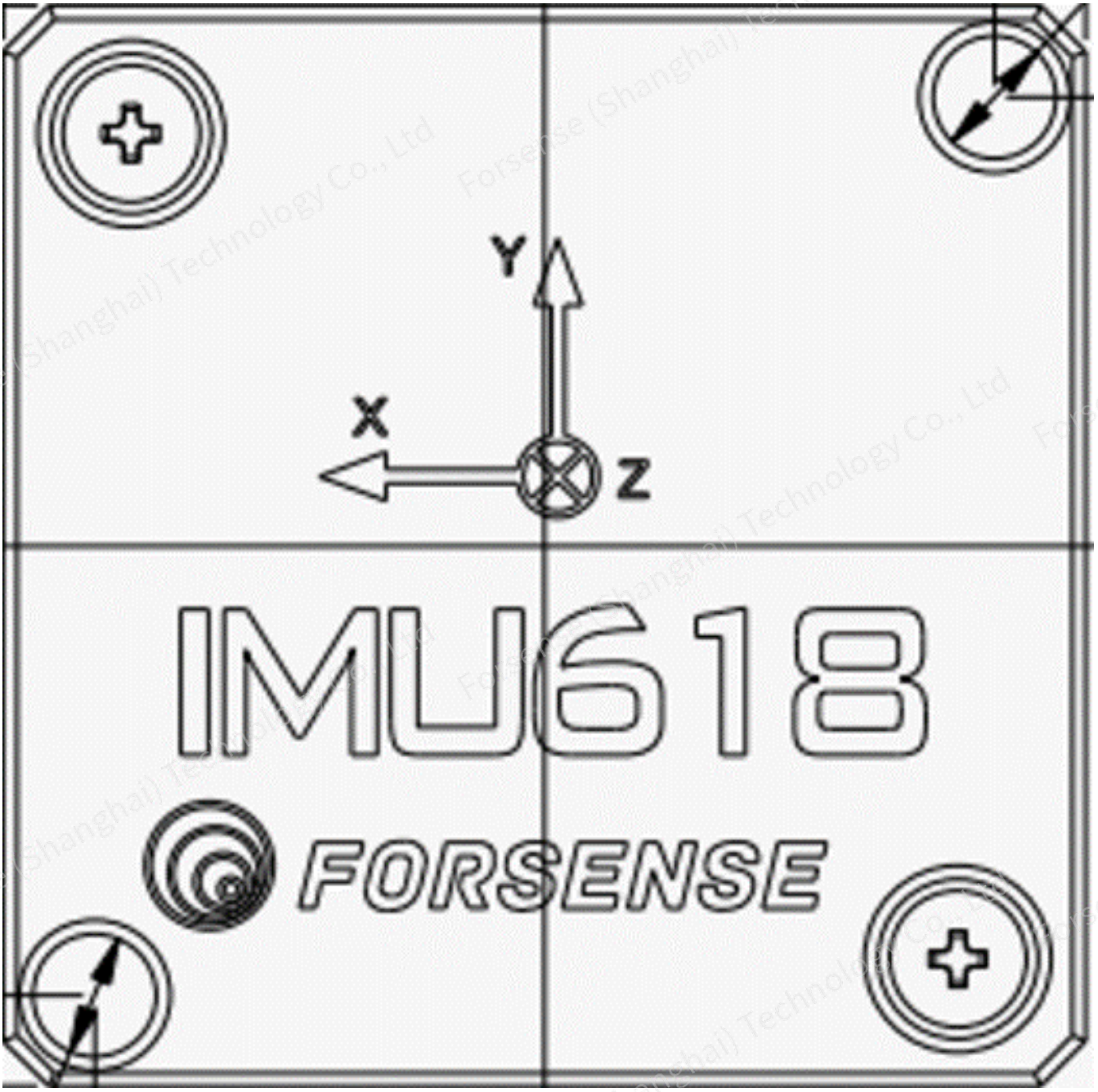
5. Communication Protocol

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 System Definition



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

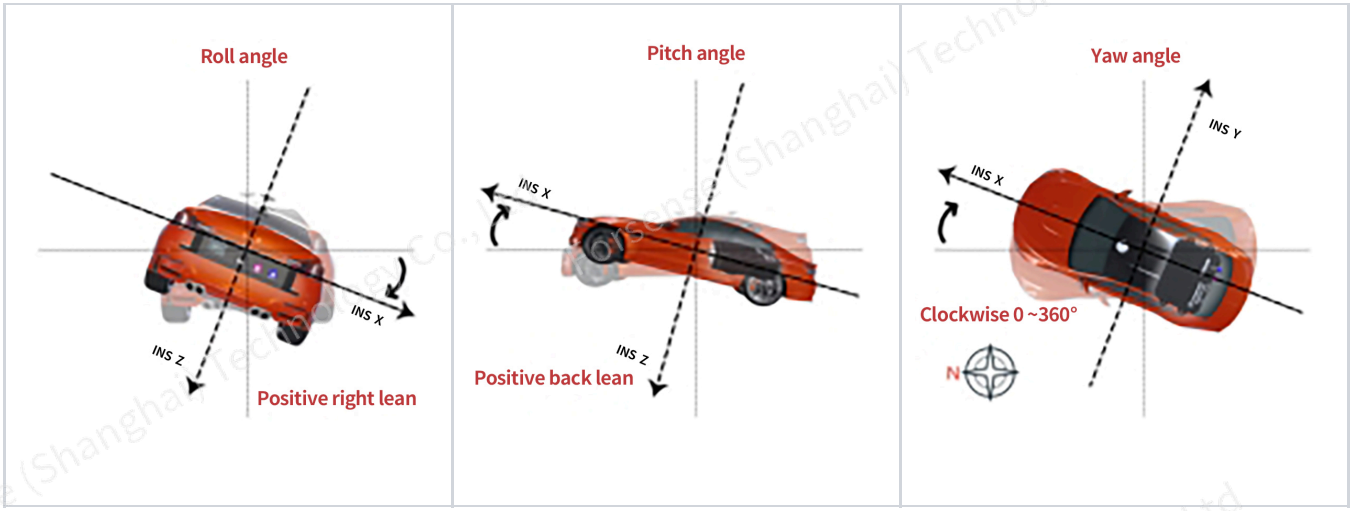
Rotation about the Z-axis: Yaw angle Yaw range: 0° ~ 360°;

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

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

The diagram below illustrates Roll, Pitch, and Yaw angle angles:

Figure7 Roll, Pitch, Yaw angle Diagram



7. Usage Example

7.1 Device Installation

1. The module should be firmly secured to a rigid flat surface, avoiding installation in locations with significant vibration.

2. The orientation of the module installation should be consistent with the direction of the vehicle front.

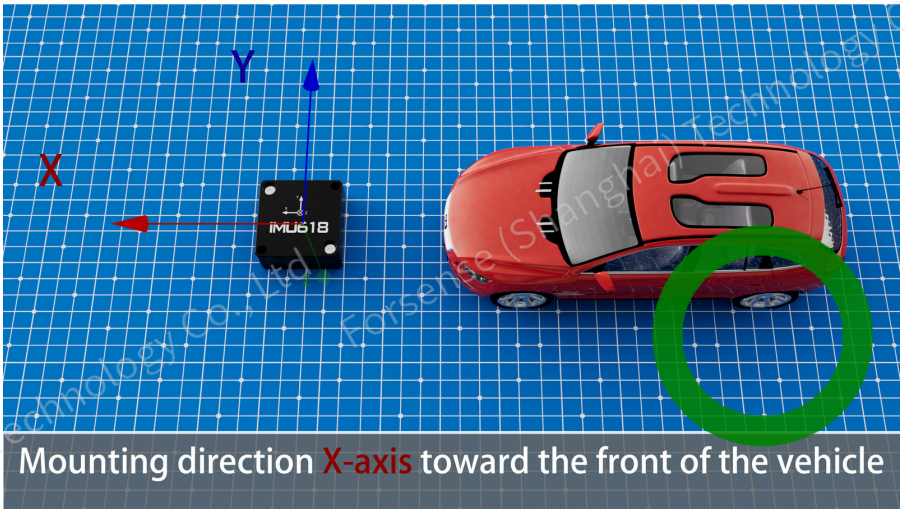
Figure8 Module Installation Diagram



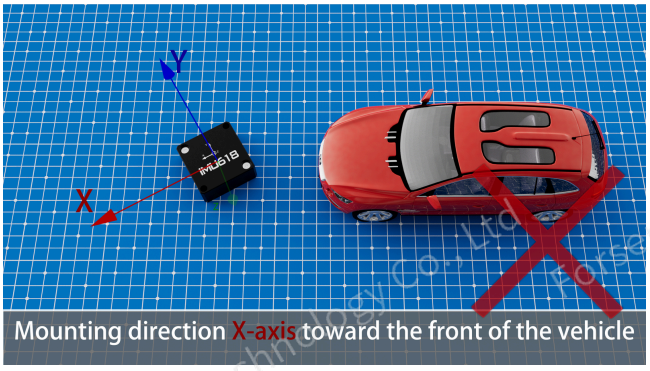
The correct installation diagram is shown below

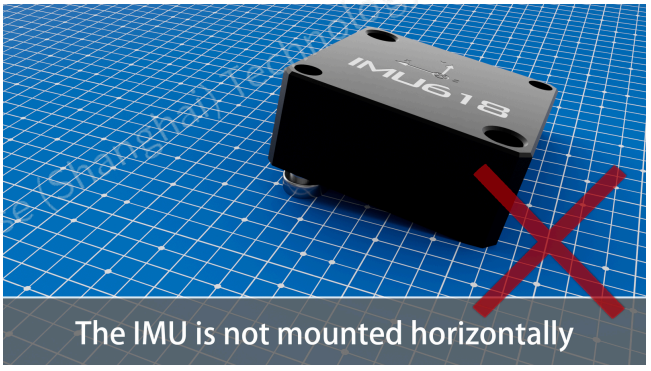
X-axis points toward the front of the vehicle

Figure9 Correct Installation Diagram

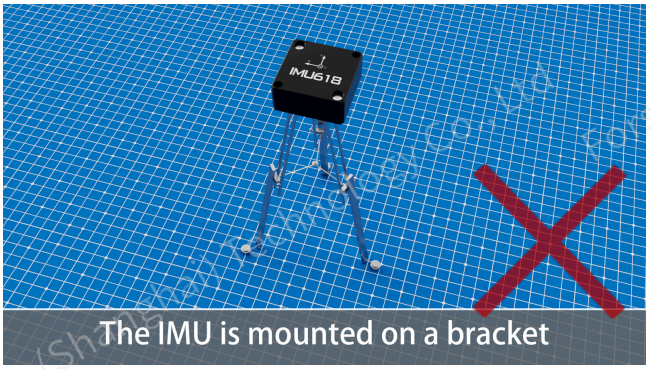


The following installation methods are incorrect



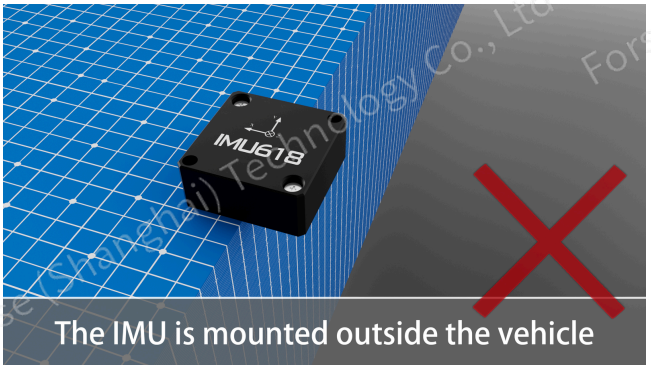








The IMU is fixed by hand



The IMU is mounted outside the vehicle

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8. Revision History

Latest Manual Version: IMU618-H_Datasheet_Product Manual(en)

Version	Date	Status/Notes
Version 1.0	2024.06.12	Initial Draft
Version 1.1	2025.01.24	Release
Version 1.2	2025.08.01	Simplified Communication Protocol

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