FORSENSE
原极科技

Tactical MEMS 6-DOF Inertial sensor

FSS-IMU618 Product Manual

Characteristic

Tactical MEMS gyroscope

- 2.0°/h bias stability
- 0.02°/s bias repeatability
- 0.04°/s output noise

Tactical MEMS accelerometer

- Zero bias stability of 20ug
- 0.5 mg bias repeatability
- 0.5mg output noise

Wide range temperature compensation

- Temperature compensation from -40 ℃ to 85 ℃
- Fine temperature calibration

Turntable Calibration

- Independent calibration for each module: sensitivity, bias, non-orthogonal error
- Provide user installation error calibration interface

High reliability

- Shock resistance: 2000g (0.5ms, half sine, 3-axis)
- Shock vibration:10g（10~2KHz， 3-axis
- Stable operation at full temperature: -40 ℃~85℃
- 100% magnetic shielding

Flexible digital interface, small size

- Configurable output sampling rate up to 400Hz
- Support serial port, I2C, SPI, CAN multiple interfaces
- Size of 24 * 24* 10mm and weighs only 10g

Product description

FSS-IMU618 is a 6-DOF MEMS inertial sensor module made by Forsense technology. Standard outputs are three-axis gyroscope and acceleration information and high-precision attitude angles.

It is high precision, high resolution, it can capture subtle vibration and tilt. The output of **a large number of processes** makes it possible to sense the movement in **large dynamic situations**. All modules are equipped with wide temperature range of **temperature compensation** and **independent calibration** in the factory, so that the module can work in various extreme conditions, and ensure the high consistency.

The reserved integrated navigation interface can be compatible with the current mainstream satellite navigation.

Application area

- Automatic driving: vehicle, agricultural machinery, engineering vehicle, underwater
- Precision measurement: underground, tunnel, vibration, tilt
- Stable platform: PTZ, UAV
- Automatic control: industrial equipment, automatic control system

On the basis of standard performance and output parameters, Forsense also provides **customized services for your special needs**，and helps you in the product!

Catalogue

Figure Example

Table Example

1. Performance Parameter

1.1 Key specification of Gyroscope

Table 1 Key specification of Gyroscope

PARAMETER	TEST CONDITIONS /REMARKS	MIN	TYP	MAX	UNIT
Measuring range			±500		°/s
Bias stability X-axis	@25℃, 1σ		2.0		°/hr
Bias stability Y-axis	@25℃, 1σ		2.0		°/hr
Bias stability Z-axis	@25℃, 1σ		1.5		°/hr
Bias repeatability	@25℃, 1σ		0.02		°/s
Non orthogonal between axes			0.01		deg
G value sensitive error			0.01		°/s/g
Internal low pass cutoff frequency	Software adjustable	0.2	47	47	Hz
ODR[1]		1	100	400	Hz
Measurement delay				5.0	ms
Zero bias variation in full temperature range[2]	-40 ~ 85℃, rms		0.1		°/s
Random walk X-axis[3]	Allan variance@25℃, 1σ		0.25		$°/\sqrt{hr}$
Random walk Y-axis	Allan variance@25℃, 1σ		0.2		$°/\sqrt{hr}$
Random walk Z-axis	Allan variance@25℃, 1σ		0.0.2		$°/\sqrt{hr}$
Output noise[4]	rms@47Hz cf		0.04		°/s
Scale factor error			1.5		‰
Scale factor nonlinearity			100		ppm

[1]The maximum output update rate is not greater than 200Hz@115200bps

[2]1 ℃/min Temperature range means the test environment, but also the RMS value

[3]According to IEEE standard, Allan variance curve is given under static 25 ℃

[4]RMS index under static 25 ℃ environment and cut-off frequency of 47Hz

1.2 Key specifications of Accelerometer

Table 2 Key specifications of Accelerometer

PARAMETER	TEST CONDITIONS /REMARKS	MIN	TYP	MAX	UNIT
Measuring range			±6		g
Bias stability	@25℃, 1σ		20		μg
Bias repeatability	@25℃, 1σ		0.5		mg
Non orthogonal between axes			0.01		deg
Internal low pass cutoff frequency	Software adjustable	0.2	47	47	Hz
ODR[1]		1	100	400	Hz
Measurement delay				5.0	ms
Zero bias variation in full temperature range[2]	-40 ~ 85℃, rms		XY:1.5 Z:2		mg
Random walk X-axis[3]	Allan variance@25℃, 1σ		0.03		$m/s/\sqrt{hr}$
Random walk Y-axis	Allan variance@25℃, 1σ		0.03		$m/s/\sqrt{hr}$
Random walk Z-axis	Allan variance@25℃, 1σ		0.04		$m/s/\sqrt{hr}$
Output noise[4]	rms@47Hz cf		0.5		mg

[1]The maximum output update rate is not greater than 200Hz@115200bps

[2]1 ℃/min Temperature range means the test environment, but also the RMS value

[3]According to IEEE standard, Allan variance curve is given under static 25 ℃

[4]RMS index under static 25 ℃ environment and cut-off frequency of 47Hz

1.3 Key parameters of Attitude Angle

Table 3Key parameters of Attitude Angle

PARAMETER	TEST CONDITIONS /REMARKS	MIN	TYP	MAX	UNIT
Roll angle	Static / Dynamic		±0.2/±0.5		°
Pitch angle	Static / Dynamic		±0.2/±0.5		°
Heading angle	One rotation at sign 1 sigma		0.4		°
ODR[1]		1	100	400	Hz

[1]The maximum output update rate is not greater than 200Hz@115200bps

Figure 1 Allan variance curve of Gyroscope

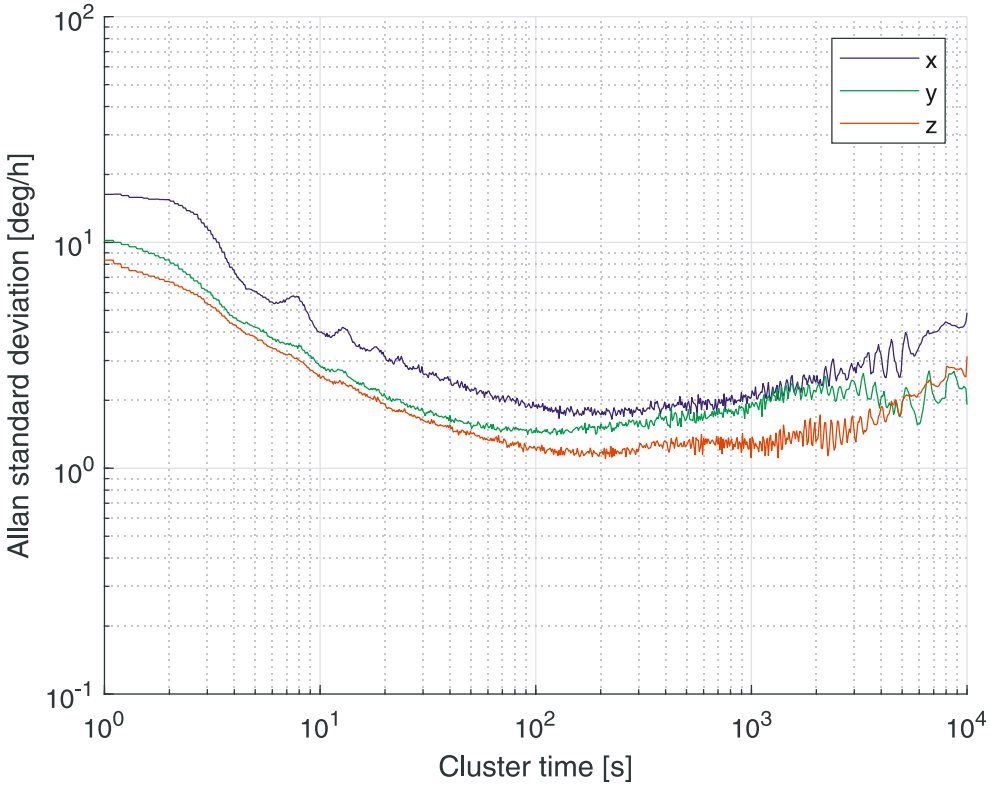
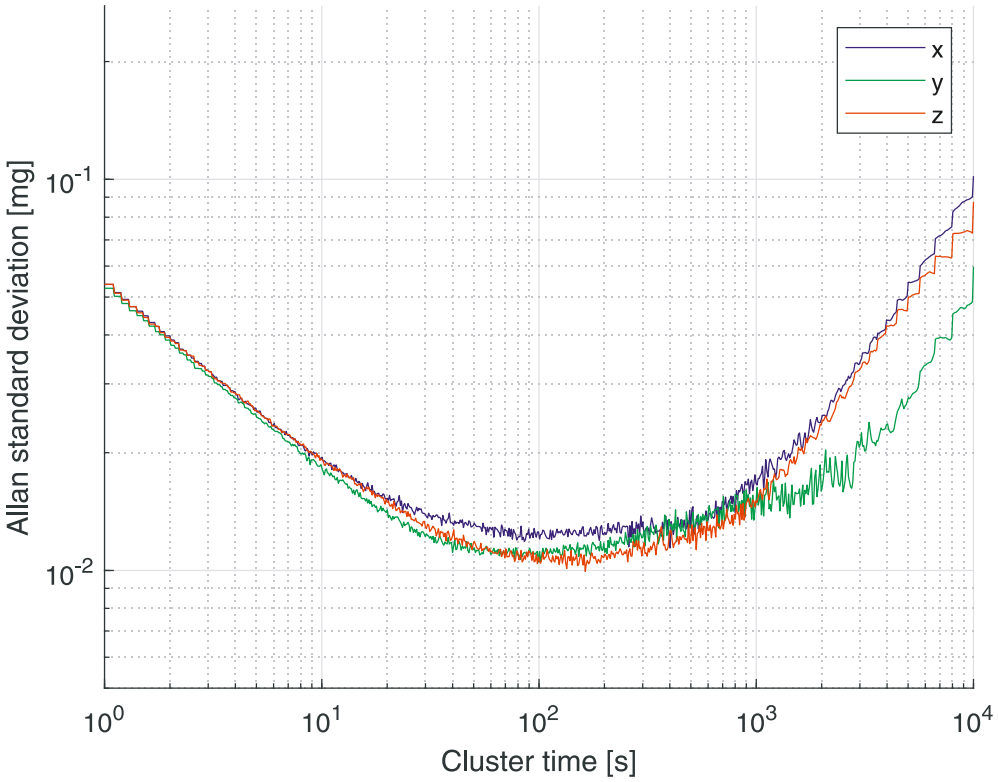
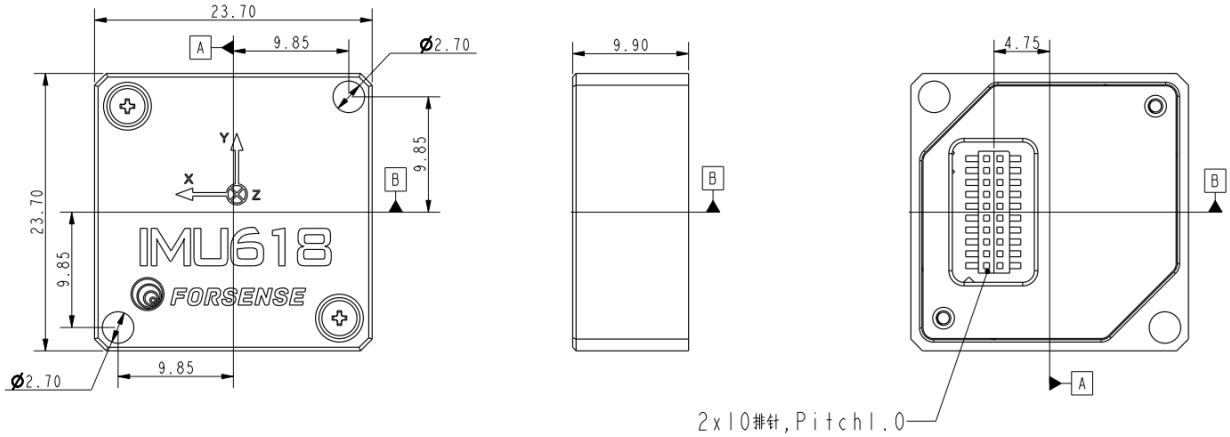


Figure 2 Allan variance curve of Accelerometer



2. Configuration

Figure 3 Outline structure and dimensions（Unit：mm）



3. Electrical Characteristics

Table 4 Electrical characteristics

Parameter	Symbol	Interface type	Min	Type	Max	Unit
Power input	VCC		3.2	3.3	3.4	V
Serial output	TX1	UART	3.2		VCC	V
Serial input	RX1	UART	0.3		VCC	V
Reserved pin	NC	IO	0.3		VCC	V
Electric current	I		50		150	mA
Temperature	T		-40		85	℃

4. Pin Description

Figure 4 Pin diagram

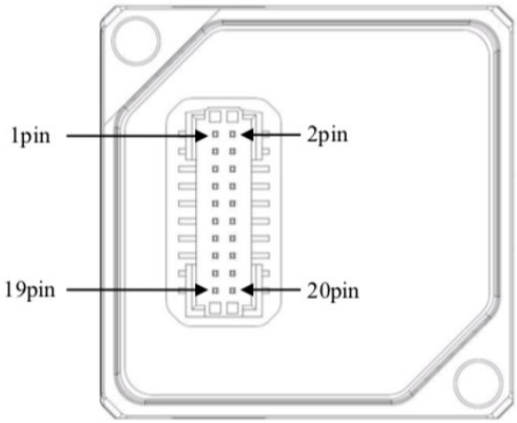


Table 5 pin description

Pin Number	Name	Type	Function
1	SCLK	I	SPI clock
2	SDO	O	SPI data MISO
5	SDI	I	SPI data MOSI
6	/CS	I/O	Selected SPI films
7	TX	O	Serial output
8	CAN_TX	O	CAN port send，not connected when suspended
9	RX	I	Serial input
13	DRDY/SCL	I/O	Data ready / I2C clock
14	EXT/SDA	I/O	External trigger sampling / I2C data
15	CAN_RX	I	CAN port send，not connected when suspended
16	/RST	I	External hardware reset input
11，12	VCC	S	3.3V power
3，4	GND	S	land
19	SEL	I	SPI / I2C mode control, suspended or connected, low level: SPI, high level: I2C
10，17，18，20	NC	N/A	Not connected

Note1 Pin type: I is input, O is output, S is power supply, N / A is unused

Note2 When the host is initialized, reset the IMU hardware once by using / RST