GNI11AY
Inertial Measurement Unit
Datasheet

1. Overview

The GNI11AY Micro-inertial Measurement Unit (IMU) is a small, high-performance, low-cost inertial measurement unit (IMU) based on MEMS technology, which can measure 3-axis angular velocity and accelerated speed.

This device provides stable measurement performance as a result of its error compensation of temperature and axes. It ensures the stable and excellent performance of the product under static and on-board dynamic conditions, and ensures that it still provides excellent and reliable measurement data for users under harsh environmental conditions.

Product features

a) Gyroscope, accelerometer and other core devices can be controlled autonomously;

b) Full temperature compensation, unique calibration technology and method;

c) Excellent environmental adaptability, fully meeting the requirements of vehicle environment;

d) Operating Temp: -40℃~85℃;

e) Storaging Temp: -40℃~95℃;

f) Small size, high precision, high reliability and strong anti-interference ability.

Application field

a) Unmanned aerial vehicle

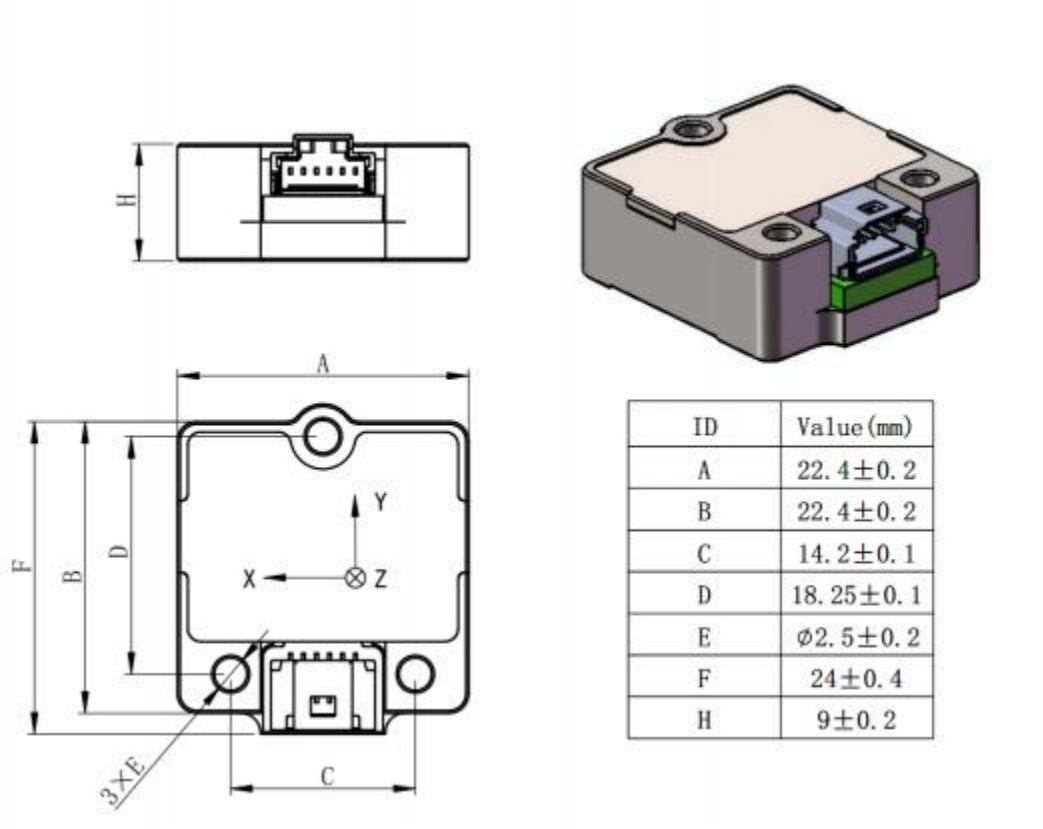
b) Unmanned driving

c) Robot

d) Surveying and mapping field

2. Package information

Figure 2.1 shows GNI11AY outline and mechanical data.



ID	Value(mm)
A	22.4±0.2
B	22.4±0.2
C	14.2±0.1
D	18.25±0.1
E	ø2.5±0.2
F	24±0.4
H	9±0.2

z

Note: The product size H is the shell size (without connector). If the connector is included, the height H is 9.8± 0.3mm.

Figure 2.1 GNI11AY package outline and mechanical data

3. GNI11AY specifications

Gyros performance	
Range	±250 °/s
Bias in Full temperature (1σ,10s on average)	⩽150 °/h
Bias Stability(1σ,10s on average)	⩽10 °/h
Bias Repeatability(1σ)	⩽10 °/h
Angular Random Walk	⩽0.25 °/√Hz
Scale Factor Non-linearity	⩽50 ppm
Installation Error	⩽ 0.7 °
Bandwidth	⩾100 Hz
Accelerometers performance	
Range	±10 g
Bias in Full temperature (1σ,10s on average)	⩽2.5 mg
Bias Stability(1σ, 10s on average)	⩽0.2 mg
Bias Repeatability(1σ)	⩽0.2 mg
Scale Factor Non-linearity(±1g)	⩽200 ppm
Installation Error	⩽ 0.7 °
Bandwidth	⩾100 Hz
System performance	
Refresh Rate	400 Hz
Weight	⩽25 g
Size	24 mm×22.4 mm×9 mm
Supply Voltage	5±0.3 V
Power Consumption	⩽0.25 W
Interface	UART
Connector	Molex
Operating Temp.	-40 ℃~+85 ℃
Storaging Temp.	-40 ℃~+95 ℃

4. Pin description and Digital interfaces

4.1 Pin description

The Molex connector is used for information exchange by UART between GNI11AY and upper computer.

Product End Model : Molex connector 5015680607.The definition is shown in Figure 3.1 and Table 3.1

Model of the opposite end : Molex connector 5013300600.

Table 3.1 Pin connection

Pin#	Name	Function
6	VCC(+5V)	Power supply
5	GND	Connect to GND
4	TXD	Transmitter
3	RXD	Receiver
2	-	-
1	-	-

Notes: The information transfer pins(TXD,RXD) are based on GNI11AY;

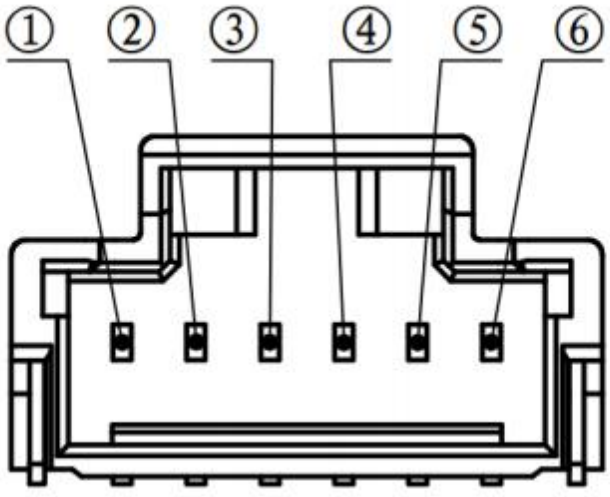


Figure 3.1 Pin connections

4.2 Digital interfaces

The default baudrate of GNI11AY is 921600, with 8-bit data bits, 1-bit stop bit and without parity bit. The refresh rate of 400 Hz. The interface communication protocol is shown as table 3.2.

Table 3.2 Communication data structure

Byte	Values	Value Type	Description
0	0xBD		-
1	0xDB		-
2	0x0A		-
3~6	LSB MID 1 MID 2 MS B	Float	Gx Factor 1 Unit deg/s
7~10	LSB MID 1 MID 2 MS B	Float	Gy Factor 1 Unit deg/s
11~14	LSB MID 1 MID 2 MS B	Float	Gz Factor 1 Unit deg/s
15~18	LSB MID 1 MID 2 MS B	Float	Ax Factor 1 Unit m/s^2

19~22	LSB MID 1 MID 2 MS B	Float	Ay Factor 1 Unit m/s^2
23~26	LSB MID 1 MID 2 MS B	Float	Az Factor 1 Unit m/s^2
27	LSB	Signed	Temperature

Byte	Values	Value Type	Description
			Factor 0.006 Minimun -60 Maximun +125 Unit ℃
28	MSB		
29	BIT	UnSigned	Built-in Test Self Check Error (00)
30	Reserved	Reserved	Reserved (00)
31	LSB	UnSigned	Counter Factor 1 Minimun 0 Maximum 65535 Unit ms
32	MSB	UnSigned	
33	Check	Byte	XOR, including bytes 0~32

5. Installation requirements

GNI11AY is recommended to be fixed with M2.5 or M2 screws, the mounting hole distance is as shown in Figure 2.1, and the surface machinedM2.5 or M2 threaded holes are installed.

6. Operating steps

a) Set the input voltage according to the voltage specified by the product, and power on the product according to the electrical interface definition;

b) Check whether the output signal meets the performance specifications based on the communication protocol Settings. Product installation and electrical connection can be normal use.

7. Attentions

Micromechanical sensors are designed to sense acceleration with high accuracy at low amplitudes and contain highly sensitive structures inside the sensor element. The MEMS sensor can tolerate mechanical shocks up to several thousand g's. However these limits might be exceeded in conditions with extreme shock loads such as e.g.

hammer blow on or next to the sensor, dropping of the sensor onto hard surfaces etc.

Pay attention to the definition of the electrical interface of the product. Please strictly follow the arrangement of the leading end to avoid incorrect connection.

Product installation diagonal velocity measurement has a great impact, in order to avoid introducing installation error, installation plane is required to have good flatness.

In order to ensure the accuracy of measurement, the product must be installed firmly and reliably to avoid loose measurement errors.

We recommend to avoid g-forces beyond the specified limits during transport, handing and mounting of the sensors in a defined and qualified installation process.

This device has built-in protections against high electrostatic discharges or electric fields (e.g. 2kV HBM); however, anti-static precautions should betaken as for any other CMOS component during all phases of manufacturing, testing, packaging, shipment and handing. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the supply voltage range. Unused inputs must always be tied to a defined logic voltage level. The following guidelines are recommended:

Always manipulate the devices in an ESD-controlled environment;

Always store the devices in a shielded environment that protects against ESD damage (at minimum an ESD-safe tray and an antistatic bag);

Always wear a wrist strap when handling the devices and use ESD-safe gloves.

Please strictly follow the requirements of this manual to ensure that the external environment is consistent with the application requirements. If there is any problem, please do not remove the cover of the product or change the internal structure of the product. If there is any problem, please contact our technical staff in time.

ESD（electrostatic discharge）sensitive device.

Charged device and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.
