GNI60AY
Inertial Measurement Unit
Datasheet

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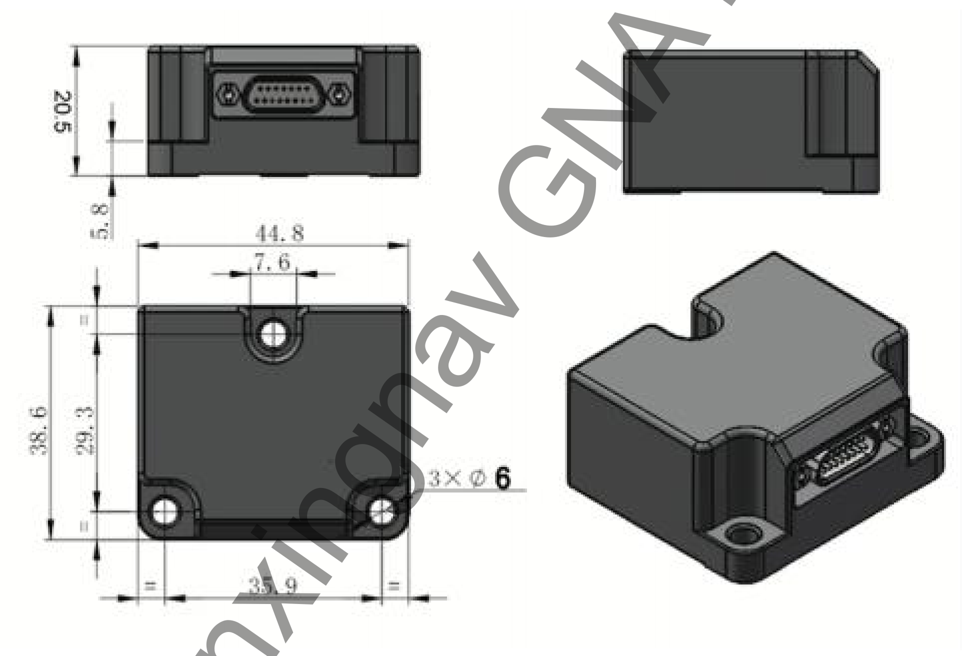
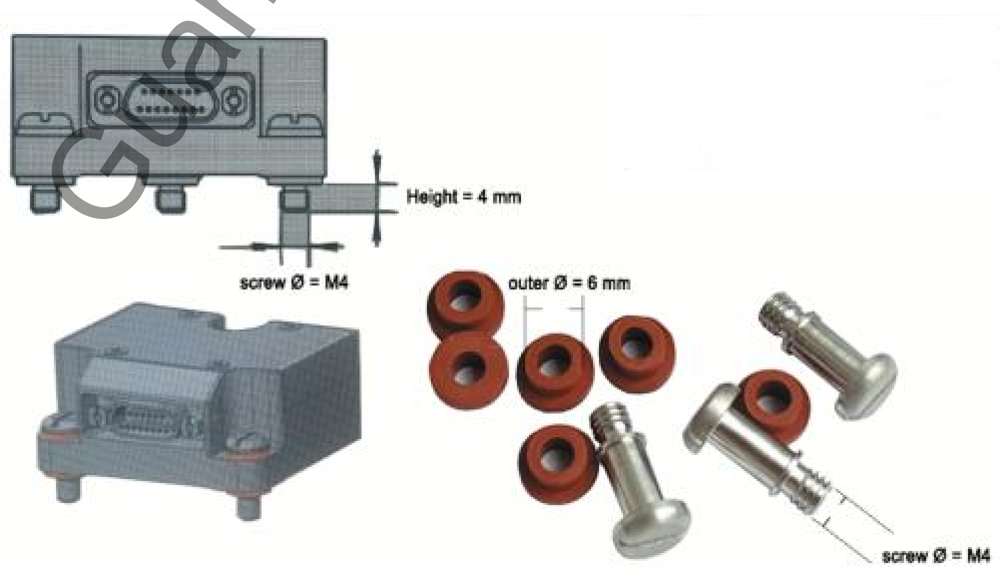
1. Overview

GNI60AY is a MEMS Inertial Measurement Unit consisting of 3 high accuracy MEMS-based gyros, 3 high stability accelerometers, power switching circuit, software of IMU, internal and external mechanical structure of energy dissipation structures and shock absorber in a miniature package. Each inertial sensor in GNI60AY is factory-calibrated for bias, sensitivity and compensated for temperature effects to provide high-accuracy measurements in the temperature range -40℃ to 85℃.





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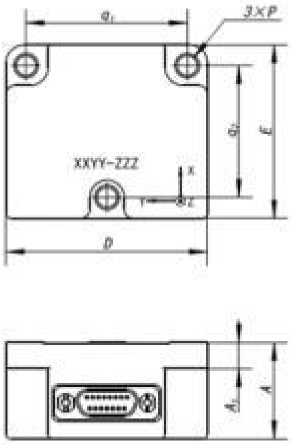
2. Package information

Figure 2.1 shows GNI60AY outline and mechanical data.（Unit： mm）



D	44.8±0.5
E	38.6±0.5
A	20±0.5
A_1	5.8±0.3
q_1	35.9±0.2
q_2	29.3±0.2
P	∅6 ±0.3

Figure 2.1 GNI60AY package outline and mechanical data

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3. GNI60AY specifications

Gyros performance	
Range	±450 °/s
Bias in Full temperature	≤100 °/h
Bias Stability	≤8 °/h
Bias Repeatability(1σ)	≤5 °/h
Scale Factor Non-linearity	≤20 ppm
Sensitive axis misalignment	10'
Threshold / Resolution	0.005 °/s
-3 bB Bandwidth	150 Hz (1~250 Hz Adjustable)
G-sensitivity	0.005 °/s/g
Accelerometers performance	
Range	±15 g
Bias in Full temperature	≤2 mg
Bias Stability (1σ, 10s on average)	≤0.2 mg
Bias Repeatability	≤0.2 mg
Scale Factor Non-linearity (±1g)	≤100 ppm
Threshold / Resolution	1 mg
Sensitive axis misalignment	10'
-3 bB Bandwidth	150 Hz (1~250 Hz Adjustable)
System performance	
Data Rate	1000 Hz
Weight	≤80 g
Size	44.8 mm×38.6 mm×21.5 mm
Supply Voltage	5±0.3 V
Power Consumption	≤1.5 W
Interface / Connector	RS422 / J30J-15ZKP
Shock Resistance	≥2000 g
Vibration level	≥20 g rms
Operating Temp.	-40 °C~+85 °C
Storaging Temp.	-55 °C~+105 °C

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4. Pin description and Digital interfaces

4.1 Pin description

The output connector (J30J-15ZKP,) is used for information exchange by RS-422 between GNI60AY and upper computer. Table 3.1 shows pin connections.

Table 3.1 Pin connection

Pin#	Name	Function
1	TX-	RS422 Transmit Negative
2	RX-	RS422 Transmit Negative
3	Blank	N/A
4	Blank	N/A
5	Blank	N/A
6	Blank	N/A
7	Blank	N/A
8	+5V	Power
9	TX+	RS422 Transmit Positive
10	RX+	RS422 Receive Positive
11	Blank	N/A
12	GND	
13	GND	
14	Blank	N/A
15	GND	

Notes:

a) The information transfer pins(Rx+,Rx-,Tx-,Tx+) are based on GNI60AY;

b) The 422 output voltage is 5 V;

c) The pin number on the connector is shown by Figure 3.1.

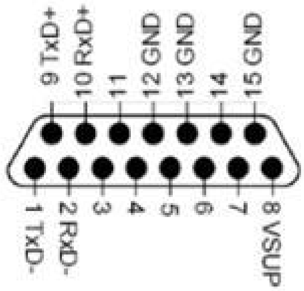

Figure 3.1 Pin connections

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4.2 Digital interfaces

The default baudrate of GNI60AY is 921600,with 8-bit data bits, 1-bit stop bit and without parity bit. The interface communication protocol is shown as table 3.2. The default RS422 output rate is set as 1000Hz.

Table 3.2 Communication data structure

Byte	Values	Factor	Description
0	0xA5	-	-
1~3	X-axis Gyro output (24 bit binary complement， high bit first)	2^{-14}	Unit: 。/s (Note a) for conversion to units)
4~6	Y-axis Gyro output (24 bit binary complement， high bit first)	2^{-14}	
7~9	Z-axis Gyro output (24 bit binary complement， high bit first)	2^{-14}	
10	0x00	-	-
11~13	X-axis accelerometer output (24 bit binary complement， high bit first)	2^{-17}	Unit: g (Note b) for conversion to units)
14~16	Y-axis accelerometer output (24 bit binary complement， high bit first)	2^{-17}	
17~19	Z-axis accelerometer output (24 bit binary complement， high bit first)	2^{-17}	
20	0x00	-	-
21~22	X-axis gyro temperature data (16 bit binary complement， high bit first)	2^{-8}	Unit: ℃ (Note c) for conversion to units)
23~24	Y-axis gyro temperature data (16 bit binary complement， high bit first)	2^{-8}	
25~26	Z-axis gyro temperature data (16 bit binary complement， high bit first)	2^{-8}	
27	0x00	-	-
28~29	X-axis accelerometer temperature data (16 bit binary complement， high bit first)	2^{-8}	Unit: ℃ (Note d) for conversion to units)
30~31	Y-axis accelerometer temperature data (16 bit binary complement， high bit first)	2^{-8}	
32~33	Z-axis accelerometer temperature data (16 bit binary complement， high bit first)	2^{-8}	
34	0x00	-	-
35	[0,255] (8 bit unsigned integer)	-	Counter

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36~37	data update time (16 bit unsigned integer， high bit first)	-	Unis： µm
38~41	Sum Check (32 bit unsigned integer， high bit first)	-	-

Notes：

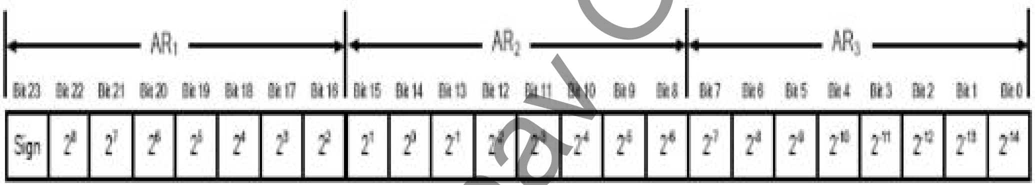
a) Gyro output[°/s]= $\frac{AR_1 \cdot 2^{16} + AR_2 \cdot 2^8 + AR_3}{2^{14}}$,

where

AR_1 is the most significant byte of the 24bit output;

AR_2 is the middle byte of the 24bit output;

AR_3 is the least significant byte of the 24bit output.



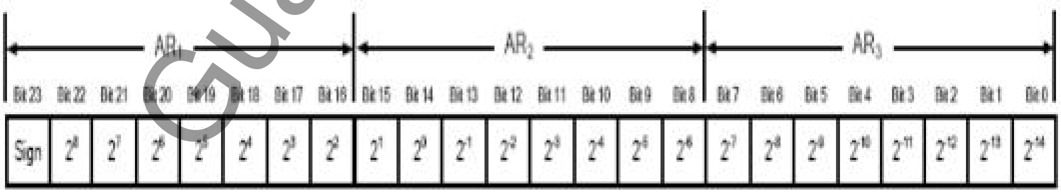
b) Accelerometer output[g]= $\frac{AR_1 \cdot 2^{16} + AR_2 \cdot 2^8 + AR_3}{2^{17}}$,

where

AR_1 is the most significant byte of the 24bit output;

AR_2 is the middle byte of the 24bit output;

AR_3 is the least significant byte of the 24bit output.



c) Gyro or Accelerometer temperature data[℃]= $\frac{T_1 \cdot 2^8 + T_2}{2^8}$,

where

T_1 is the most significant byte of the 16bit output;

T_2 is the least significant byte of the 16bit output.

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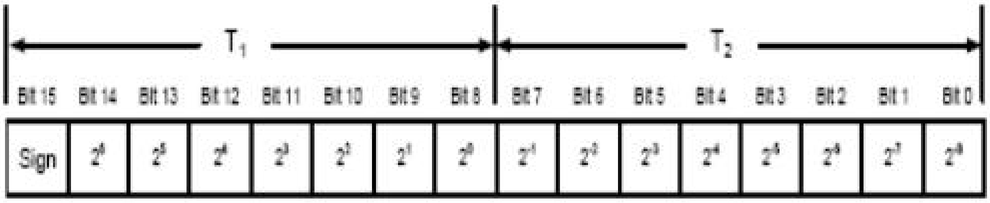

d) At the end of all datagrams is a 32-bit Checksum. The Sum checksum enables the user to detect errors in the transfer of data from GNI60AY. The Sum is calculated using the following equation: seed = 0x00000000; Sum from the zeroth byte to the thirty-seventh byte.

5. Package list

Table 4.1 shows the GNI60AY package list。

Table 4.1 Package list

Num	List
1	GNI60AY
2	Connector (J30J-15TJL)
3	Test report
4	The manual of GNI60AY

6. 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.

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 be taken 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

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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.

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.

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