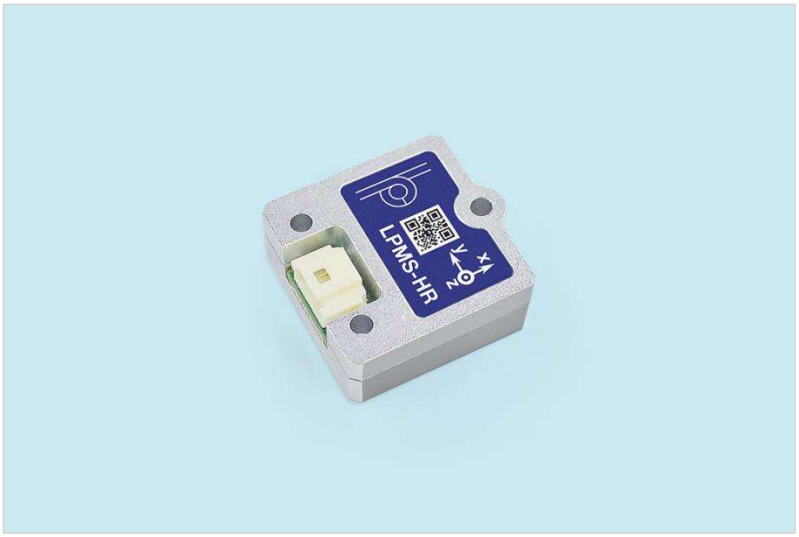
LPMS-HR Series Hardware Manual ver. 1.1



LP-Research Inc.
https://www.lp-research.com

Version History

Date	Version	Details
2025-10-11	ver. 1.0	- Initial release
2026-03-06	ver. 1.1	- Updated application fields

Table of Contents

1. Introduction

The LPMS-HR Series is a high-precision attitude sensor specifically developed for the robotics field. It integrates a 3-axis accelerometer and a 3-axis gyroscope. Through calibration and calculation using our proprietary algorithms, it provides precise data including Euler angles, quaternions, and acceleration information. Additionally, the module is compact and easy to assemble, facilitating user integration into their own systems for development and design.

For specific usage instructions of the LPMS-HR series, please refer to other relevant documentation.

Application Fields:

- Mobile Robots
- Humanoid Robots
- Construction Machinery
- Platform Stabilization and Control

Table 1-1 LPMS-HR Series Product Model Overview

Product Model	Communication Interface		
	USB	RS232	TTL
LPMS-HR USB	✓	×	×
LPMS-HR RS232	×	✓	×
LPMS-HR TTL	×	×	✓

2. System Overview

2.1. Structure Diagram

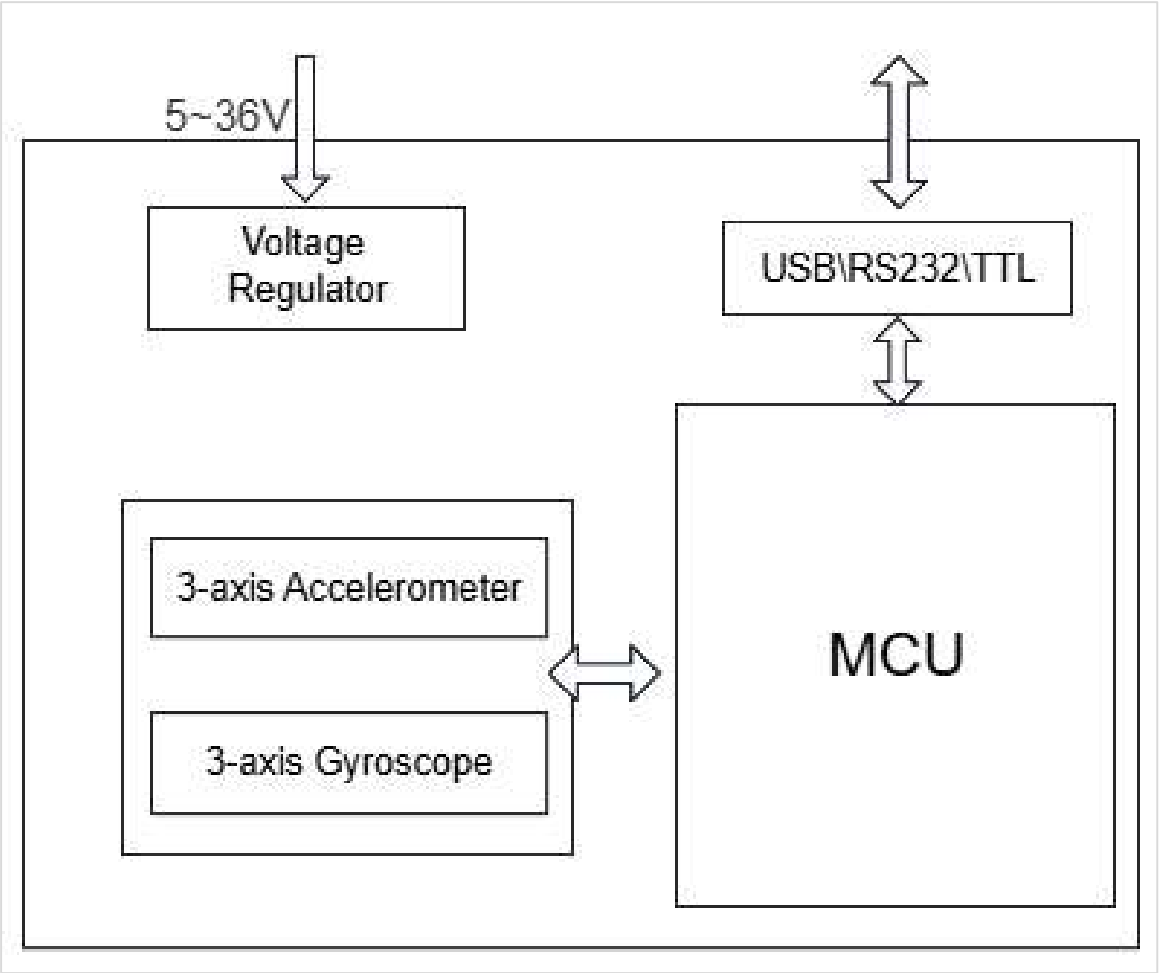


Fig. 2.1. LPMS-HR series structure diagram

2.2. Functional Pins

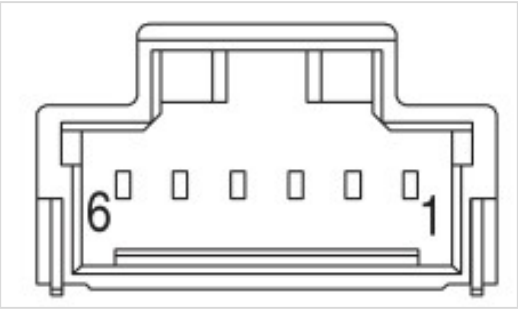


Fig. 2.2. LPMS-HR series functional pins

Table 2-1 Pin Description

Male Pin	Name	Function	Remarks
1	VCC	Power	USB:5V RS232/TTL:5~36V
2	GND	-	Ground
3	D- / RS232_TX / UART_TX	Communication Interface	USB Data Signal Negative / RS232 Transmit Pin / TTL Transmit Pin
4	D+ / RS232_RX / UART_RX		USB Data Signal Positive / RS232 Receive Pin / TTL Receive Pin
5	NRST	Reset	Active low, <1.1V
6	SYNC	Time Sync	Synchronization data input

2.3. Sync Input Function

The Sync pin of the LPMS-HR sensor is used to receive external synchronization signals and can be left floating when not in use.

When the sensor is configured in sync mode (SET_SYNC_MODE, GET_SYNC_MODE, see User Manual 4.1 Appendix Firmware Function / Command Code List), a data frame is output each time a rising edge is detected on the SYNC pin. This function is primarily used to receive high-precision square wave pulses generated by the master controller to trigger high-frequency synchronized IMU data. The delay from detecting a rising edge on the SYNC pin to the output of the data frame is 124μs (see figure below).

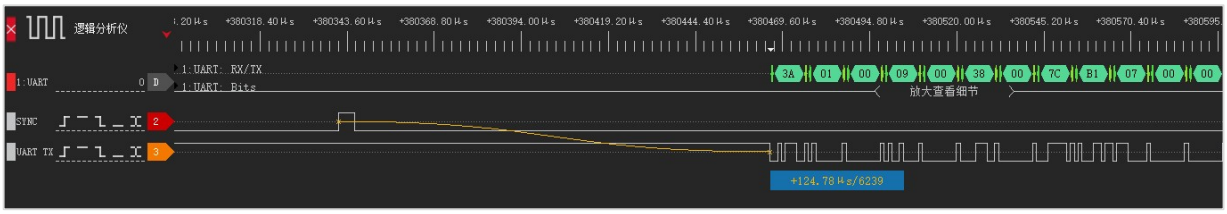


Figure 2.3. LPMS-HR series sync function

Notes:

- The input frequency for the SYNC pin must not exceed 1000Hz.
- If data output cannot keep up with the SYNC pin frequency, increase the baud rate or reduce the data volume.
- After the SYNC pin is pulled high and before data is available on UART TX, any subsequent SYNC pin rising edges will be ignored.
- While the SYNC pin is held high, it will not briefly respond to commands.

3. Performance Parameters

3.1. General Parameters

Table 3-1 General Parameters

Parameter	Condition	Value			Unit
		Min.	Typ.	Max.	
Power Supply [1]		5		36	V
Max. Input Current [2]		38 (@5V)		7 (@36V)	mA
Size			22.4x22.4x11		mm
Weight		9.5	10	10.5	g
Euler Angle Range	roll	-180		+180	deg
	pitch	-90		+90	deg
	yaw	-180		+180	deg
Angle Resolution			0.01		deg
Baud Rate		9600	115200[3]	921600	bps
Power Consumption	USB		0.13 (26mA@5V)		W
	RS232		0.105 (21mA@5V)		W
	TTL		0.095 (19mA@5V)		W
Output Frequency		5	100	1000	Hz
Operating Temperature		-40	25	85	°C
Connector Type			Molex		

[Note 1] The maximum input supply voltage for USB communication is 5V.

[Note 2] When using RS232/TTL communication, if connecting to a high-power regulated power supply (such as a 48V to 24V output regulator), a significant inrush current may occur at the moment of power-on. This inrush current may exceed the sensor's maximum rated value and could damage the sensor. Therefore, it is recommended to perform a step-by-step power-up sequence when powering the sensor with a high-power regulated source: connect the sensor only after the power supply output has stabilized.

[Note 3] The product's default baud rate.

			5015680607		

3.2. Accelerometer Parameters

Table 3-2 Accelerometer Performance Parameters

Parameter	Typical Value	Unit
Measurement Range	±3/±6/±12/±24	g
Sensitivity	0.092/0.195/0.366/0.733	mg/LSB
Sensitivity Variation / Temp.	±0.01	%/K
Static Zero Bias	20	mg
Static Bias Temp. Drift	<0.2	mg/K
Noise Density	160(X&Y-axis),190(Z-axis)	μg/√Hz
Bias Instability	26.88	ug
Random Walk	0.03	m/s/√hr

3.3. Gyroscope Parameters

Table 3-3 Gyroscope Performance Parameters

Parameter	Typical Value	Unit
Measurement Range	±125/±250/±500/±1000/±2000	dps
Sensitivity	3.815/7.629/15.259/30.518/61.035	mdps/LSB
Sensitivity Variation / Temp.	±0.03	%/K
Static Zero Bias	±1	dps
Static Bias Temp. Drift	±0.015	dps/K
Noise Density	14	mdps/√Hz
Bias Instability	4.41	deg/√hr
Random Walk	1.45	deg/h

4. Mechanical Information

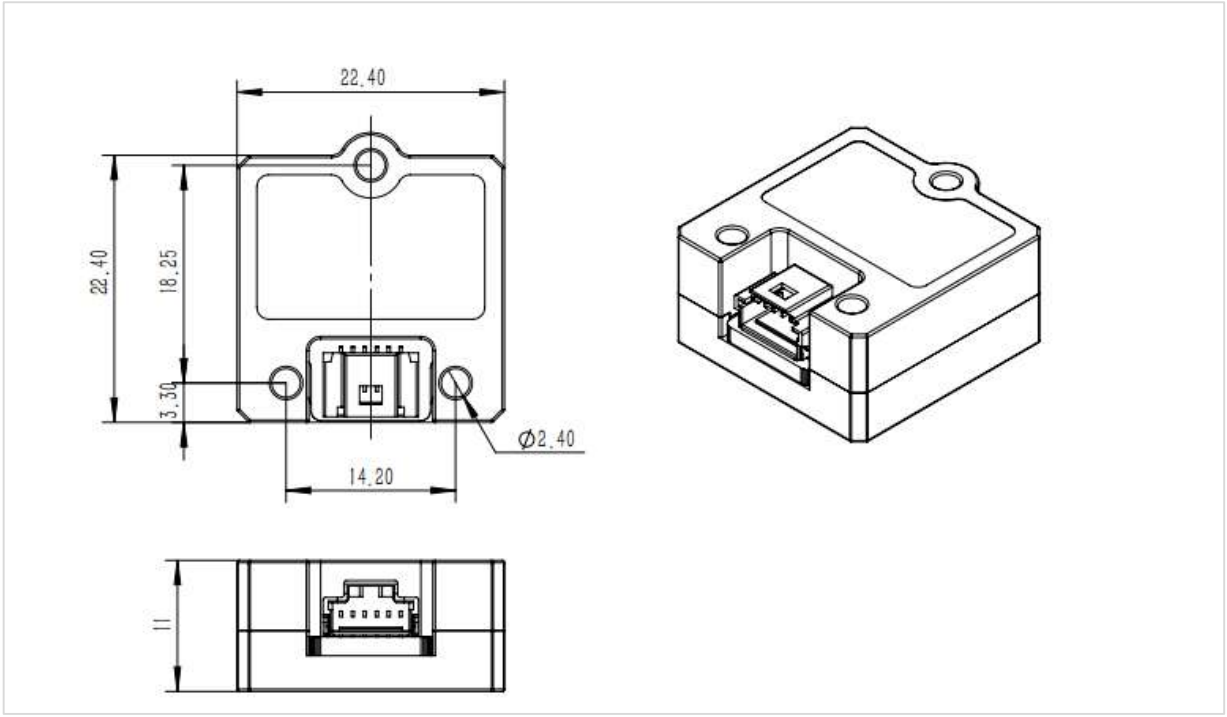


Fig.5.1. LPMS-HR series dimensions (unit: mm)