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XYGStudy LC29H

XYGStudy LC29H Dual-Band GPS Module

INSTRUCTION MANUAL

Model: LC29H(AA) GPS HAT

Contents Overview Features Package Setup Operation Specifications & Support Maintenance Troubleshooting Warranty

1. OVERVIEW

The XYGStudy LC29H Series Dual-Band GPS Module is a high-precision GNSS expansion board designed for compatibility with Raspberry Pi series boards and Jetson Nano. It utilizes advanced L1+L5 dual-band positioning technology and supports multi-GNSS signals to provide accurate and reliable location data. This module is ideal for applications requiring centimeter-level positioning accuracy, such as real-time tracking systems and smart agricultural machinery.

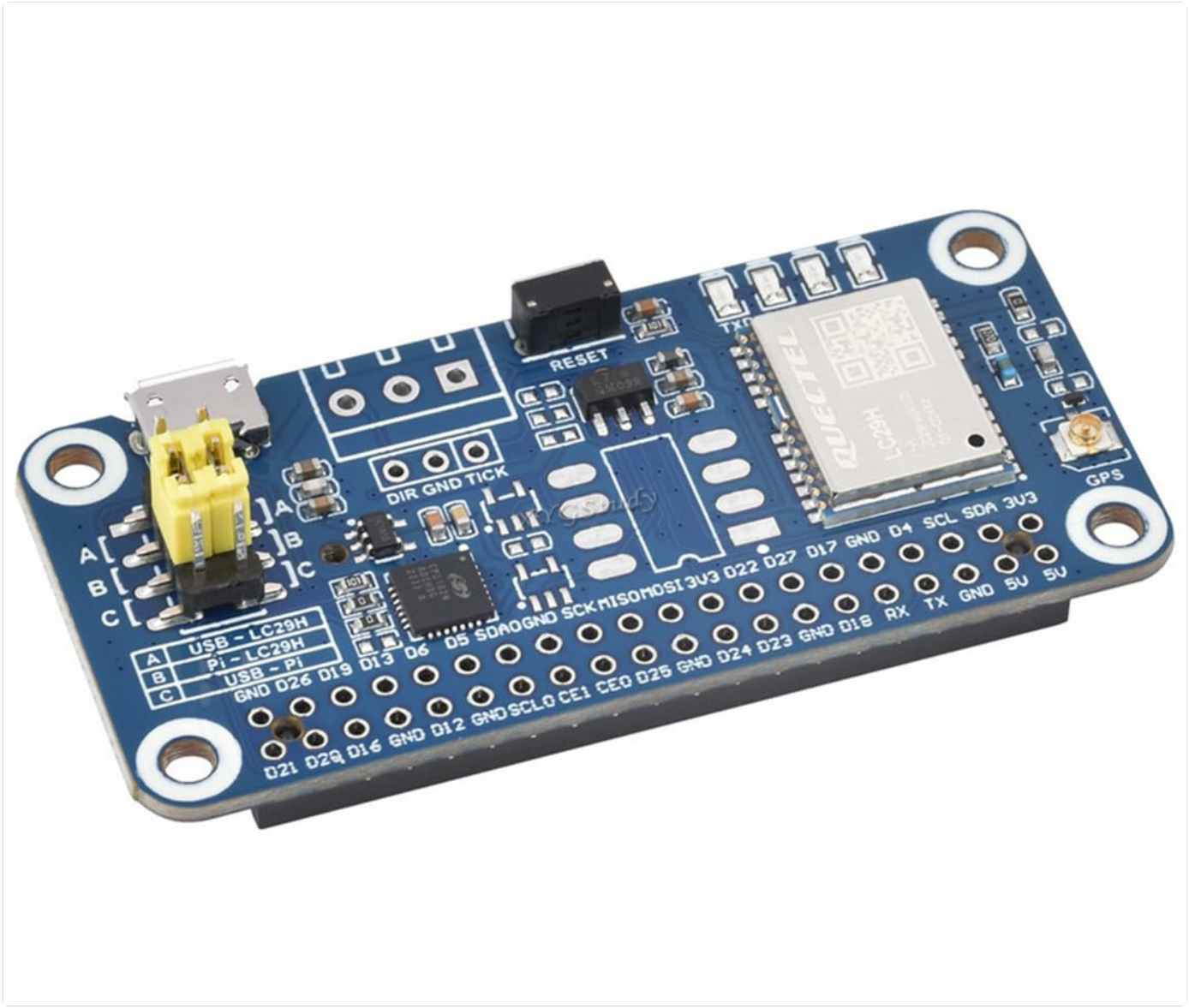


Figure 1: XYGStudy LC29H Dual-Band GPS Module

2. Package Contents

Verify that all items listed below are included in your package:

- LC29H(AA) GPS HAT x1
- 2x20PIN female header x1
- GPS External Antenna (D) x1
- IPEX 1 to SMA cable ~17cm x1
- Screws pack x1

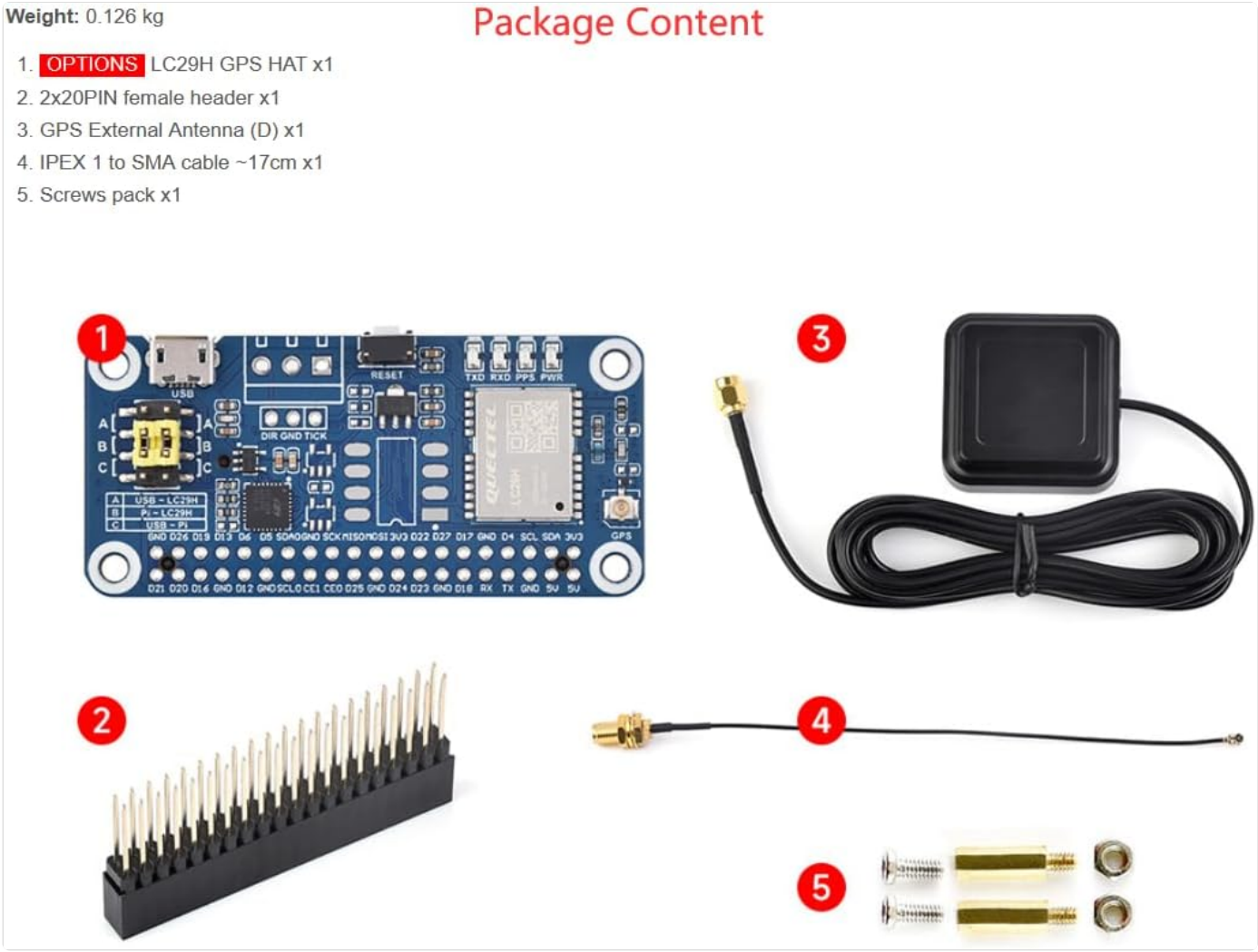


Figure 2: Included components: (1) LC29H(AA) GPS HAT, (2) 2x20PIN female header, (3) GPS External Antenna (D), (4) IPEX 1 to SMA cable, (5) Screws pack.

3. Key Features

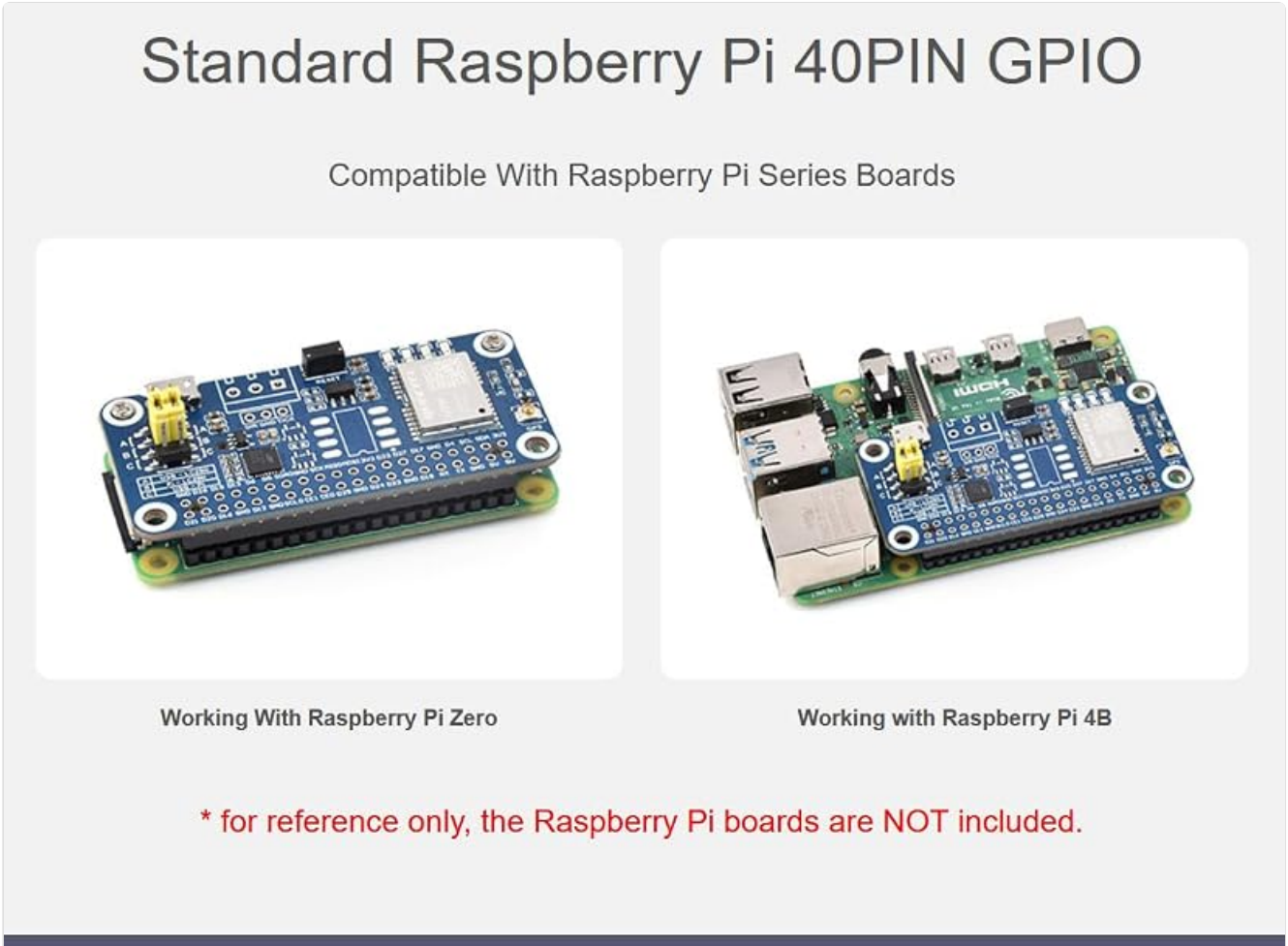
- **Dual-Band L1+L5 Positioning:** Tracks L1+L5 dual-frequency and multi-GNSS signals, significantly reducing multipath effects in urban environments and improving positioning accuracy.
- **High Sensitivity & Anti-Interference:** Features a built-in Low Noise Amplifier (LNA) and Surface Acoustic Wave (SAW) filter for enhanced sensitivity and strong anti-interference capabilities.
- **Centimeter-Level Accuracy:** Adopts dual-band positioning and RTK technology to achieve high-precision positioning, suitable for demanding applications.
- **Wide Compatibility:** Equipped with a standard Raspberry Pi 40PIN GPIO extension header, supporting Raspberry Pi series boards and Jetson Nano.
- **Multi-GNSS Support:** Concurrent reception of GPS, BDS, GLONASS, Galileo, and QZSS systems while maintaining low power consumption.
- **Assisted GNSS (A-GNSS):** Reduces Time To First Fix (TTFF) with cold start when powered on to 5 seconds.
- **Onboard Battery Holder:** Supports ML1220 rechargeable cell for preserving ephemeris information and hot starts.
- **LED Indicators:** Four onboard LEDs provide module operating status.

4. Setup and Installation

4.1 Hardware Connection

1. **Attach the LC29H HAT:** Carefully align the 2x20PIN female header of the LC29H GPS HAT with the GPIO pins on your Raspberry Pi or Jetson Nano board. Gently press down to ensure a secure connection.

2. **Connect the External Antenna:** Connect the IPEX 1 to SMA cable to the IPEX connector on the LC29H module. Then, attach the GPS External Antenna (D) to the SMA connector of the cable. Position the antenna in an area with a clear view of the sky for optimal signal reception.
3. **Secure the Module (Optional):** Use the provided screws to secure the LC29H HAT to your host board if mounting holes are available and desired.





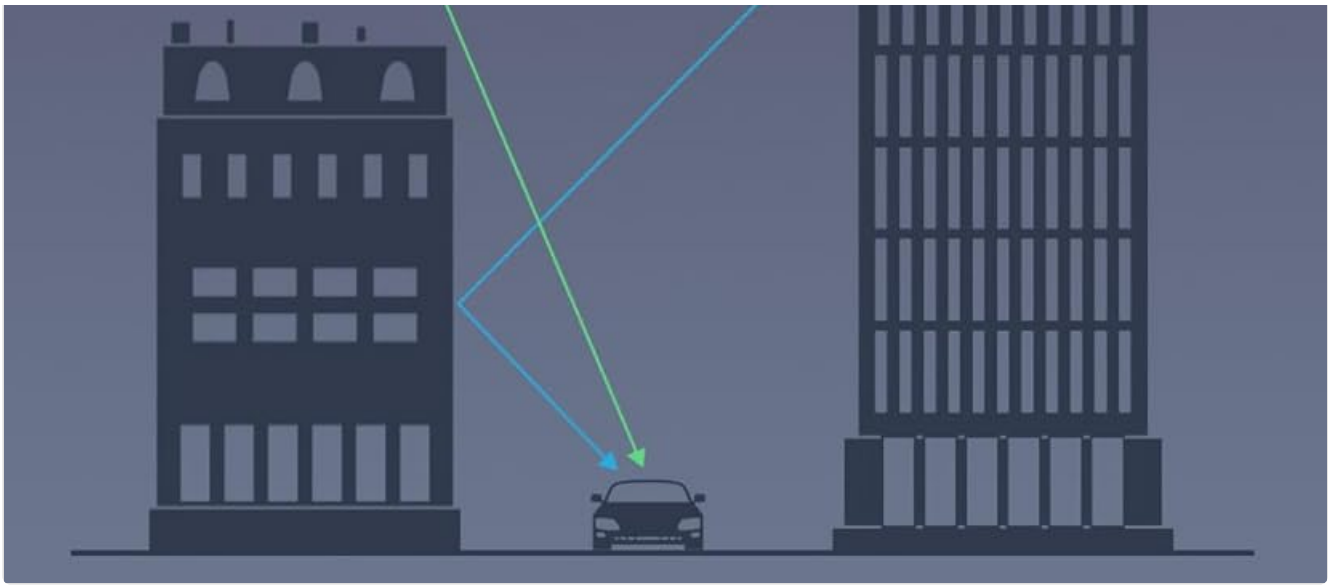


Figure 3: LC29H GPS HAT connected to a Raspberry Pi board. The module is compatible with various Raspberry Pi models and Jetson Nano.

4.2 Component Identification and Pinout

Refer to the diagram below for identification of key components and the pinout definition of the LC29H module.

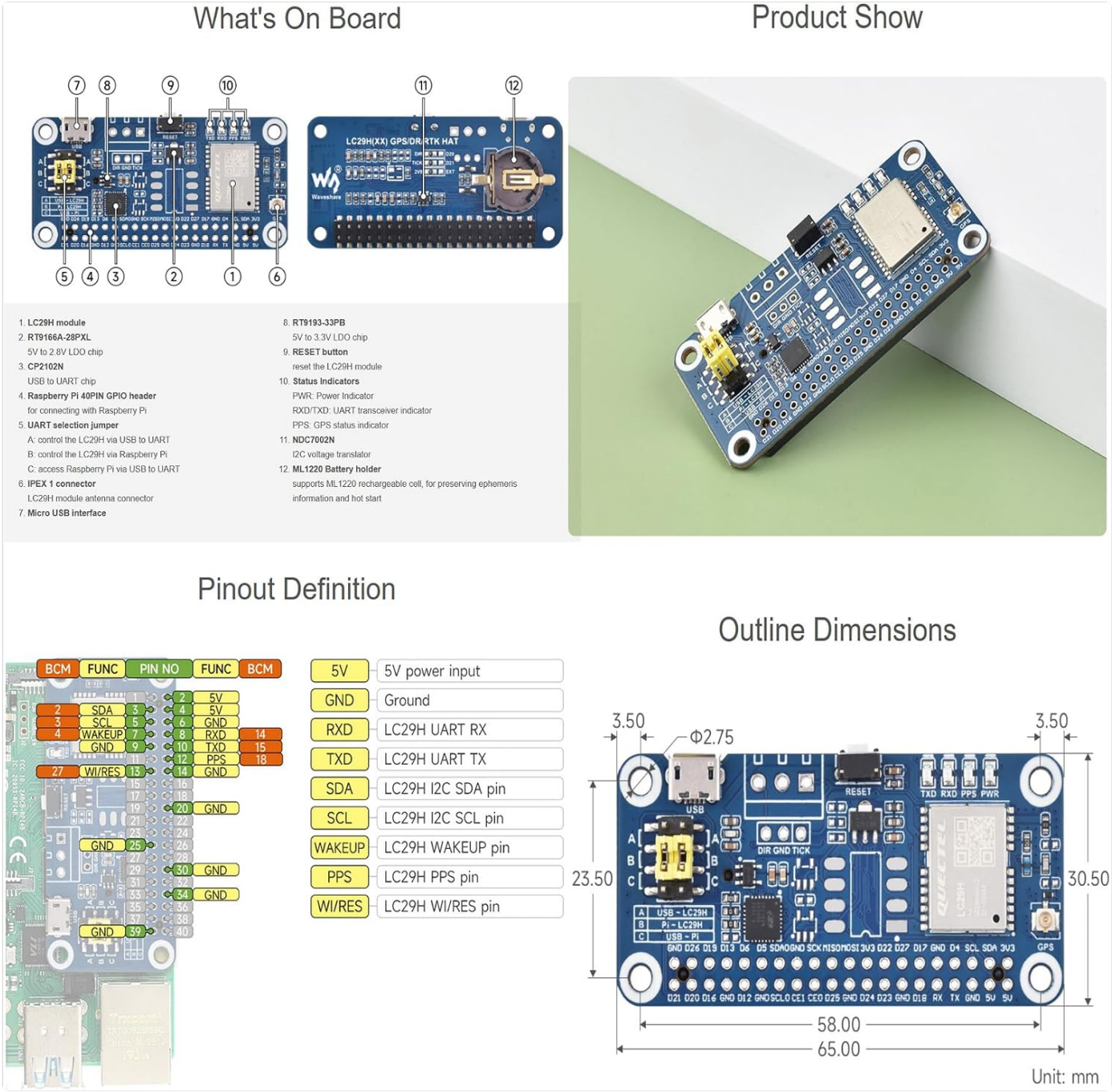


Figure 4: Detailed view of the LC29H module showing component layout, pin definitions, and outline dimensions. This includes the LC29H module, 3.3V LDO chip, GPS UART chip, Raspberry Pi 40PIN GPIO header, UART selection jumper, IPEX 1 connector, Micro USB interface, RT9193-33PR, RESET button, Status Indicators (PWR, PPS, FIX), NDKC7020, and ML1220 Battery holder.

Key Components:

- **LC29H module:** The core GNSS receiver.
- **3.3V LDO chip:** Voltage regulator.
- **GPS UART chip:** Manages serial communication.
- **Raspberry Pi 40PIN GPIO header:** For connecting to host boards.
- **UART selection jumper:** Configures UART communication.
- **IPEX 1 connector:** For external antenna connection.
- **Micro USB interface:** For power or data (depending on model variant).
- **Status Indicators:** LEDs for Power (PWR), Pulse Per Second (PPS), and Fix status.

Pinout Definition:

- **5V:** 5V power input.

- **GND:** Ground.
- **RXD:** LC29H UART RX (connect to host TX).
- **TXD:** LC29H UART TX (connect to host RX).
- **SDA:** LC29H I2C SDA pin.
- **SCL:** LC29H I2C SCL pin.
- **WAKEUP:** LC29H WAKEUP pin.
- **PPS:** LC29H PPS pin (Pulse Per Second output).
- **WI/RES:** LC29H WI/RES pin.

4.3 Software Configuration

The LC29H module typically communicates via UART or I2C. For Raspberry Pi and Jetson Nano, you will need to configure the serial port and install necessary libraries or drivers. Refer to the official documentation or resources provided by XYGStudy for specific software setup instructions, including Python examples for Raspberry Pi/Jetson Nano. The module operates under Linux operating systems. Ensure your host device's OS is properly configured for serial communication.

5. Operation

5.1 Initial Power-Up and Signal Acquisition

Once the module is connected and the host device is powered on, the LC29H will begin searching for GNSS signals. The onboard LED indicators will provide status feedback:

- **PWR LED:** Indicates power supply status.
- **PPS LED:** Flashes when a valid GPS fix is acquired, indicating a Pulse Per Second signal.
- **FIX LED:** Illuminates steadily when a 3D fix is achieved.

For optimal performance, ensure the external antenna has an unobstructed view of the sky. The module supports Assisted GNSS (A-GNSS) to reduce the Time To First Fix (TTFF), especially during cold starts.

5.2 Dual-Band L1+L5 Positioning

The LC29H module utilizes L1+L5 dual-band satellite signals. This technology significantly enhances positioning accuracy and reliability, particularly in challenging environments like urban canyons where multipath effects are common.





Figure 5: Illustration of dual-band L1+L5 positioning, showing how signals from different frequencies improve accuracy by reducing multipath interference.

5.3 Multi-GNSS System Reception

The module supports concurrent reception of signals from multiple Global Navigation Satellite Systems (GNSS), including GPS, BDS (BeiDou), GLONASS, Galileo, and QZSS. This multi-system capability improves signal availability and positioning robustness.

Features At A Glance

The **LC29H series** can track L1+L5 dual-frequency and multi-GNSS signals, reducing multipath effects in urban canyons and improving positioning accuracy while maintaining low power consumption. With built-in LNA and SAW filter to achieve high sensitivity and strong anti-interference capability. Adopts dual-band positioning and RTK technology to meet the need of centimeter-level high-precision positioning. Ideal for real-time tracking systems and sharing economy applications, helping to develop applications such as smart farm machinery and shared two-wheelers, etc.

- Standard Raspberry Pi 40PIN GPIO extension header, supports Raspberry Pi series boards, Jetson Nano
- Supports simultaneous tracking of L1+L5 dual-band satellite signals, reducing multipath effects in urban canyons and improving positioning accuracy
- Supports concurrent receiving of multi-GNSS systems (GPS, BDS, GLONASS, Galileo and QZSS) while maintaining low power consumption

- LC29H(AA) GPS HAT with the following features:
  - Supports positioning augmentation systems (WAAS, EGNOS, MSAS and GAGAN) to improve the positioning performance of service areas
  - Supports EASY technology, to realize the positioning using stored information such as ephemeris and almanac data when there is no signal, and improve the positioning and time to first fix

- LC29H(DA) GPS/RTK HAT with the following features:
  - Supports fast convergence dual-band RTK centimeter-level positioning, suitable for high-precision positioning of terminal devices

- LC29H(BS) GPS/RTK HAT with the following features:
  - Supports GNSS raw observation and correction data output, suitable for establishing RTK base station

- Built-in low noise amplifier and acoustic surface filter to realize -165dBm high sensitivity and enhance anti-interference performance
- Supports multi-frequency active interference cancellation, effectively suppressing or eliminating narrowband signal (WiFi/2/3/4/5G) interference to ensure navigation accuracy
- A-GNSS (Assisted GNSS) support, reducing the time to first fix (TTFF) with cold start when powered on to 5 seconds
- Support QGNSS software, easy to set various module functions
- Onboard battery holder, supports ML1220 rechargeable cell, for preserving ephemeris information and hot starts
- Onboard 4 LED indicators for module operating status
- Comes with online development resources and manual (Python examples for Raspberry Pi/ Jetson Nano)

Version Options

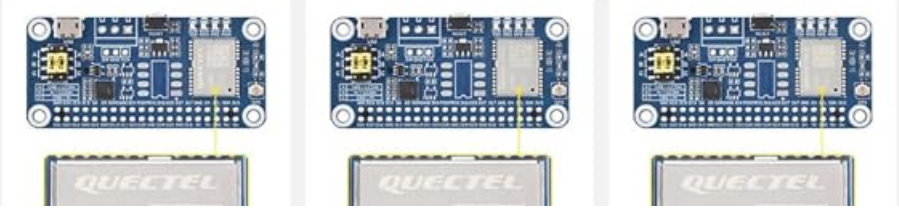




Figure 6: Diagram illustrating the concurrent reception of signals from multiple GNSS constellations (GPS, BDS, GLONASS, Galileo, QZSS) for enhanced positioning.

5.4 RTK Technology for Centimeter-Level Accuracy

For applications requiring centimeter-level precision, the LC29H module integrates RTK (Real-Time Kinematic) technology. This requires a base station providing correction data to the module. Consult the specific documentation for RTK setup and configuration.

6. Specifications

The following table details the technical specifications of the LC29H Dual-Band GPS Module:

Specifications

PRODUCT		LC29H(AA) GPS HAT	LC29H(DA) GPS/RTK HAT	LC29H(BS) GPS/RTK HAT	ZED-F9P GPS-RTK HAT
FREQUENCY BAND		GPS/QZSS: L1C/A, L5 BDS: B1I, B2a Galileo: E1, E5a GLONASS: L1			GPS/QZSS: L1C/A, L2C BDS: B1I, B2I Galileo: E1B/C, E5a GLONASS: L1OF, L2OF
NUMBER OF CONCURRENT GNSS		GPS/QZSS+BDS+Galileo+GLONASS			
SBAS (WAAS, EGNOS, MSAS, GAGAN)		support	-		support
RTK FUNCTION		-	RTK Rover	RTK Base	RTK Rover and Base
POSITIONING ACCURACY	PVT	1m CEP		-	1.5m CEP
	RTK	-	0.01m+1ppm CEP	-	0.01m+1ppm CEP
NAVIGATION UPDATE RATE	PVT	1~10Hz		-	1~10Hz
	RTK	-	1Hz	-	1~8Hz
	RAW	1Hz			1~20Hz
RTK CONVERGENCE TIME		-	<10s	-	<10s
TIME TO FIRST FIX (AGNSS OFF)	COLD STARTS	26s		-	24s
	HOT STARTS	1s		-	2s
	AIDED STARTS	16s		-	2s
TIME TO FIRST FIX (EASY ON)		2s	-		
TIME TO FIRST FIX (AGNSS ON)	COLD STARTS	5s		-	TBD
	HOT STARTS	5s		-	TBD

	AIDED STARTS	5s		-	TBD
SENSITIVITY	TRACKING AND NAVIGATING	-165dBm			-167dBm
	RE-ACQUISITION	-159dBm	-157dBm	-159dBm	-160dBm
	COLD STARTS	-147dBm	-145dBm	-147dBm	-148dBm
VELOCITY ACCURACY		0.2m/s	-		0.05m/s
PPS ACCURACY		20ns	-		30ns
DYNAMIC PERFORMANCE		Acceleration (Max): 4g			
		Altitude (Max): 10000m			Altitude (Max): 50000m
		Velocity (Max): 500m/s			
COMMUNICATION INTERFACE		UART(9600~3000000bps, 115200bps by default), I2C(Max 400KHz)			USB, UART(4800~921600bps, 9600bps by default), I2C(Max 400KHz), SPI(5MHz)
PROTOCOL		NMEA 0183 V4.10, RTCM 3.x			NMEA 0183 V4.10, UBX, RTCM 3.3
POWER SUPPLY		5V			
OVERALL CURRENT		<40mA@5V (Continue mode)			
OPERATING TEMPERATURE		-40~85°C			
DIMENSIONS		65×30.5mm			

Figure 7: Detailed specifications table for LC29H(AA), LC29H(DA), LC29H(BS) GPS/RTK HAT models, including supported GNSS, frequency bands, accuracy, update rates, time to first fix, sensitivity, and communication interfaces.

General Specifications

Attribute	Value
Brand	XYGStudy
Model Name	LC29H
Part Number	LC29H(AA) GPS HAT
Connectivity Technology	GPIO
Operating System	Linux
Compatible Devices	Raspberry Pi, Jetson Nano
Processor Brand	ARM
RAM Memory Technology	LPDDR4
UPC	719704484602

7. Maintenance

The LC29H GPS Module is designed for reliable operation with minimal maintenance. Follow these general guidelines to ensure its longevity:

- **Keep Dry:** Protect the module from moisture and liquids.
- **Cleanliness:** Keep the module free from dust and debris. Use a soft, dry cloth for cleaning if necessary.
- **Temperature:** Operate and store the module within its specified operating temperature range (-40°C to 85°C) to prevent damage.
- **Antenna Care:** Ensure the external antenna cable is not kinked or damaged. Position the antenna securely.

8. Troubleshooting

If you encounter issues with your LC29H GPS Module, consider the following troubleshooting steps:

- **No GPS Fix:**
  - Ensure the external antenna is securely connected and has a clear, unobstructed view of the sky.
  - Verify that the module is receiving power (check PWR LED).
  - Check software configuration to ensure the correct serial port or I2C address is being used and data is being read.
  - Allow sufficient time for a cold start (up to 26 seconds, see specifications).
- **Low Positioning Accuracy:**
  - Relocate the antenna to an area with better sky visibility, away from tall buildings or dense foliage.
  - Ensure the module is receiving dual-band L1+L5 signals.
  - If using RTK, verify the base station connection and correction data integrity.
  - Check for potential sources of electromagnetic interference near the module or antenna.
- **Communication Issues:**
  - Verify all GPIO connections between the module and the host board are correct and secure.
  - Check UART/I2C settings (baud rate, parity, stop bits) in your software.
  - Ensure the UART selection jumper is correctly set for your desired communication method.
- **Module Not Powering On:**
  - Confirm the host board (Raspberry Pi/Jetson Nano) is powered on.
  - Check the power supply to the host board.
  - Inspect the LC29H HAT for any visible damage.

9. Warranty and Support

9.1 Warranty Information

The XYGStudy LC29H Dual-Band GPS Module comes with a**1-Year Warranty** from the date of purchase. This warranty covers manufacturing defects and malfunctions under normal use. It does not cover damage caused by misuse, accidents, unauthorized modifications, or improper installation.
Please retain your proof of purchase for warranty claims.

9.2 Technical Support

For technical assistance, additional resources, or to report issues, please contact XYGStudy customer support. You may find further documentation, drivers, and example code on the official XYGStudy website or by contacting the seller directly through the platform where the product was purchased.
When contacting support, please provide your product model (LC29H(AA) GPS HAT), purchase date, and a detailed description of the issue.

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