IamaPLC: Waveshare LoRA products

>> Back to LoRa Main topics

Waveshare offers a diverse range of LoRa and LoRaWAN products, primarily categorized into Gateways for network infrastructure, HATs/Expansion Boards for Raspberry Pi/Pico, Arduino, and standalone Core Modules for embedded integration.

Product Category	Example Models	Primary Chip	Interface	Key Features
LoRaWAN Gateway	SX1302/SX1303 868M Gateway HAT	SX1302 / SX1303	SPI (via Mini-PCIe)	8-10 channels, multi-node concurrency, high sensitivity (-141dBm)
Plug-and-play USB interface	USB-TO-LoRa-xF	SX1262	USB/UART (with AT commands	**LF** for 410–510MHz or **HF** for 850–930MHz
Node Expansion HAT	SX1262 LoRaWAN/GNSS HAT	SX1262	SPI	Standard 40-pin GPIO, integrated GPS (GNSS) on some models, LoRaWAN support
Point-to-Point HAT	SX1262/SX1268 LoRa HAT	SX1262 / SX1268	UART	Proprietary *"private"* protocol, does not support LoRaWAN, easy AT command config
Development Boards	RP2040-LoRa	SX1262 + RP2040	Internal SPI	All-in-one MCU + LoRa board, USB-C programming, compact form factor
Core Modules	Core1262 HF/LF	SX1262	SPI	Minimalist stamp-hole design for direct soldering onto custom PCBs
Industrial DTU	SX1262-LoRa-DTU-xF	SX1262	RS232/485/422	Rail-mount, aluminum alloy case, long-range wireless serial bridge

Important Selection Criteria

- **LoRa vs. LoRaWAN:** Many Waveshare HATs are split by protocol. The UART Interface models often use a proprietary protocol and cannot connect to standard LoRaWAN gateways such as The Things Network.
- **Frequency Bands:** Waveshare typically offers each product in two versions: LF (Low Frequency) for 410–510MHz (e.g., CN470) and HF (High Frequency) for 850–930MHz (e.g., EU868, US915).
- **Interface Choice:** Use SPI products if you want full control via libraries (like RadioHead or LMIC); use UART or USB versions for simple plug-and-play serial data transmission.

USB-TO-LoRa-xF02

The USB-TO-LoRa-xF is an industrial-grade wireless data transfer unit from Waveshare that provides a plug-and-play USB interface for LoRa communication. It is designed to allow computers or other USB-enabled hosts to communicate over long distances using the Semtech SX1262 chip.

The "xF" in the name refers to the frequency version (e.g., LF for 410–510 MHz or HF for 850–930 MHz), and "02" typically denotes a specific hardware iteration or feature set.

USB-TO-LoRa-xF02 Lora AT commands

AT command	Status query	Type query	Description	Note
+++\r\n			Enter AT command mode	
AT+EXIT\r\n			Exit AT command mode	
ATE\r\n			Enable/disable AT command echo	
AT+VER\r\n			Check the software version number	
AT+HELP\r\n			View AT help	
AT+REBOOT\r\n			Reboot	
After all parameter changing use AT+EXIT to save the parameters!				
AT+SF=7\r\n	AT+SF?	AT+SF=?	Set the spreading factor, the value range is 7~12 *SF7:* Highest data rate, shortest range, and lowest power consumption per packet. *SF12:* Lowest data rate, longest range, and highest sensitivity for penetrating obstacles. Default value: 7	
AT+BW=0\r\n	AT+BW?	AT+BW=?	Set bandwidth, 0 means 125KHz, 1 means 250KHz, 2 means 500KHz	
AT+CR=1\r\n	AT+CR?	AT+CR=?	Set the encoding rate to 1, 1 represents 4/5, 2 represents 4/6, 3 represents 4/7, 4 represents 4/8	
AT+PWR=22\r\n	AT+PWR?	AT+PWR=?	Set the RF power, the value range is 10~22dBm Selectable Values: 10, 13, 17, or 22 Higher power levels (e.g., 22 dBm) provide the longest communication range but consume more power. At maximum power (22 dBm), the module's transient transmit current can reach approximately 100 mA to 107 mA. Default: 22	

AT command	Status query	Type query	Description	Note
AT+NETID=0\r\n	AT+NETID?	AT+NETID=?	Network ID assignment, the value range is 0~65535 Only modules with the same **Network ID**, **Frequency**, and **Air Speed** can communicate with each other. Default: 0	
AT+LBT=0\r\n	AT+LBT?	AT+LBT=?	Enable/disable LBT (*Listen Before Talk*) function, 0: disable, 1: enable module enables or disables the Listen Before Talk (LBT) function. This feature is designed to prevent data collisions by ensuring the radio channel is clear before the module begins its own transmission. In some regions (such as parts of Europe for the 868MHz band), LBT is a required alternative to strict *"Duty Cycle"* limitations to ensure fair access to the spectrum. Default: 0	
AT+MODE=1\r\n	AT+MODE?	AT+MODE=?	DTU working mode, *1: stream mode, 2: packet mode, 3: relay mode* **Stream Mode (AT+MODE=1)**: The factory default mode. It functions as a "virtual cable," where data sent to the serial port is transmitted immediately in plaintext to all other modules on the same channel. **Packet Mode (AT+MODE=2)**: Used for targeted point-to-point or point-to-multipoint communication. In this mode, you must prefix your data with the target device's Address and Channel (e.g., FF FE 12 + data). **Relay Mode (AT+MODE=3)**: Configures the module to act as a repeater node to extend the transmission range. In this mode, the device only forwards packets and does not output data to its own serial interface.	

AT command	Status query	Type query	Description	Note
AT+TXCH=18\r\n	AT+TXCH?	AT+TXCH=?	Transmit channel, value range 0~80, corresponding frequency point is 850~930MHz or 410~490MHz **LF Version** (usually labeled "LF" or marked with a 433MHz sticker) Formula: Frequency (MHz) = 410 + Channel Range: Channel 0: 410 MHz, Channel 23: 433 MHz (Default), Channel 80: 490 MHz Default: 23 (corresponding to 433 MHz). - Example: *AT+TXCH=23* sets the frequency to 433 MHz (410 + 23). - Example: *AT+TXCH=80* sets the frequency to 490 MHz (410 + 80). **HF Version** (usually labeled "HF" or marked with an 868/915MHz sticker) Formula: Frequency (MHz) = 850 + Channel Range: 850 MHz (Channel 0) to 930 MHz (Channel 80) Default Value: 18 (corresponding to 868 MHz) - Example: 868 MHz: *AT+TXCH=18\r\n* (Standard for Europe) - Example: 915 MHz: *AT+TXCH=65\r\n* (Standard for North America/Australia) - Example: 923 MHz: *AT+TXCH=73\r\n* (Common in Asia)	
AT+RXCH=18\r\n	AT+RXCH?	AT+RXCH=?	Receive channel, value range 0~80, corresponding frequency point is 850~930MHz or 410~490MHz **LF Version** (usually labeled "LF" or marked with a 433MHz sticker) Formula: Frequency (MHz) = 410 + Channel Range: Channel 0: 410 MHz, Channel 23: 433 MHz (Default), Channel 80: 490 MHz Default: 23 (corresponding to 433 MHz). - Example: *AT+TXCH=23* sets the frequency to 433 MHz (410 + 23). - Example: *AT+TXCH=80* sets the frequency to 490 MHz (410 + 80). **HF Version** (usually labeled "HF" or marked with an 868/915MHz sticker) Formula: Frequency (MHz) = 850 + Channel Range: 850 MHz (Channel 0) to 930 MHz (Channel 80) Default Value: 18 (corresponding to 868 MHz) - Example: 868 MHz: *AT+TXCH=18\r\n* (Standard for Europe) - Example: 915 MHz: *AT+TXCH=65\r\n* (Standard for North America/Australia) - Example: 923 MHz: *AT+TXCH=73\r\n* (Common in Asia)	

AT command	Status query	Type query	Description	Note
AT+RSSI=0\r\n	AT+RSSI?	AT+RSSI=?	Enable/disable RSSI (*Received Signal Strength Indicator*) signal value output, 0: disable, 1: enable. When enabled, the module appends a hexadecimal RSSI value to the end of every received data packet. Signal Quality: Typical LoRa RSSI values range from -30 dBm (very strong) to -120 dBm (very weak). Default:0	
AT+ADDR=0\r\n	AT+ADDR?	AT+ADDR=?	Set DTU (*Data Transfer Unit*) address, value range 0~65535 This address acts as the device's identity within a network. *Broadcast Address: 65535* (Hex 0xFFFF). Setting a module to this address allows it to receive data from any other module on the same channel, regardless of the sender's target address. Default:0	
AT+PORT=0\r\n	AT+PORT?	AT+PORT=?	The command is used to select the active hardware interface mode on the module. Values: 1: RS485 2: RS232 3: USB (Typically the default for this specific dongle) Typically, you do not need to change it unless you are using the same firmware on a different DTU hardware variant.	
AT+KEY=0\r\n	AT+KEY?	AT+KEY=?	Used to configure AES encryption for wireless data transmission, value range: 0: Disables encryption (*factory default*) 1 to 65535: Sets the specific key value for AES encryption	
AT+BAUD=115200\r\n	AT+BAUD?	AT+BAUD=?	Set COMx port baud rate, value range 1200~115200, 1200, 2400, ..., 57600, Common Values: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. Default: 115200	
AT+COMM="8N1"\r\n	AT+COMM?	AT+COMM=?	Set COM port parameters, data bits: 8 or 9, parity: N, O, E, stop bits: 0, 1, 2, Default: 8N1	

AT command	Status query	Type query	Description	Note
AT+AllP=xx\r\n	AT+ALLP?		Set the spreading factor to key multi-parameter [spreading factor 7..12],[bandwidth 125/250/500],[encoding rate 1..4],[RF power 10/13/17/22],[Network ID 0..65535],[LBT function 0/1],[DTU Mode 1/2/3],[Transmit channel 0..80],[Receive channel 0..80],[RSSI signal 0/1],[DTU address 0..65535],[Application Port 1..223],[Baud rate 1200..115200],[COM port "8N1"],[AES Key 0..65535] *Example:* *AT+AllP=7,125,1,22,0,0,1,18,18,0,0,3,115200, "8N1",0*	
AT+RESTORE=0\r\n	AT+RESTORE?		resets all configuration parameters to their factory default settings. 0: disabled, 1: enabled	

2026/02/28 10:20 · vamsan

Lora topics on lamaPLC

Page	Date	Tags
• lamaPLC Communication: IoT	2025/05/31 22:50	communication, iot, internet, iomt, 6lowpan, ipv4, ipv6, bluetooth, ble, li-fi, nfc, rfid, wi-fi, zigbee, z-wave, lte-advanced, 5g, lora, dash7, lpwan, lorawan, sigfox, nb-iot, weightless, rpma, mioty, vsat, ethernet, thread, matter
• lamaPLC Communication: LoRa, LoRaWAN and LoRa Mesh	2024/11/15 20:19	communication, bus, lora, lorawan, loramesh, mesh, ism, the things network, ttn, aloha, beaconing, csma, csma-ca, mac, adaptive data rate, adr, spreading factor, sf, transmission power, eu863, eu863-870, eu433, us902-928, au915-928, as923, in865-867, cn433, cn470, cn779, cn920, semtech, sx1261, sx1262, sx1276, sx1272, sx1278, encoding rate, er, time on air, toa, iot, netid, listen before talk, lbt
• lamaPLC: AI-Thinker LoRA products	2026/03/05 15:27	ai-thinker, lora manufacturer, communication, lora, modul
• LamaPLC: Arduino MKR Family	2025/08/24 10:19	arduino, board, mkr fox 1200, mkr zero, ethernet, shield, m-bus, rs-485, can, env, sd card, rgb, gps, iot, wifi, sigfox, lora, gsm, lte-m
• lamaPLC: Ebyte LoRA products	2026/03/04 14:07	ebyte, lora manufacturer, communication, lora, modul
• lamaPLC: Waveshare LoRA products	2026/03/05 14:57	waveshare, lora manufacturer, communication, lora, modul, usb-to-lora-xf02

Waveshare, Lora Manufacturer, communication, lora, modul, USB-TO-LoRa-xF02

From:
http://lamaplc.com/ - **lamaPLC**

Permanent link:
http://lamaplc.com/doku.php?id=com:waveshare_products&rev=1772723974

Last update: **2026/03/05 15:19**