SparkFun LARA-R6401

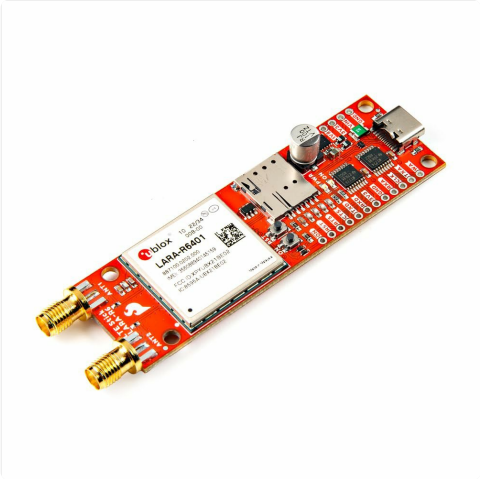
SparkFun LTE Stick - Lara-R6 User Manual

Model: LARA-R6401

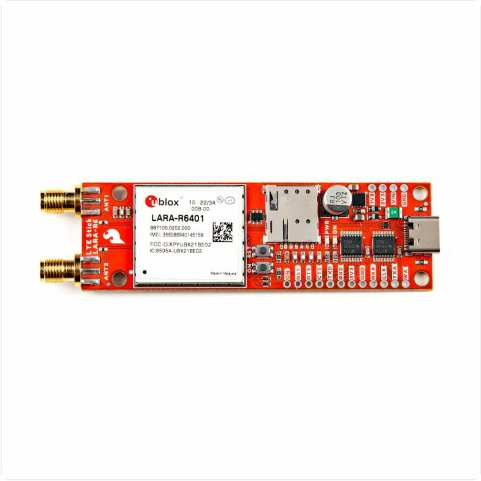
Introduction

The SparkFun LTE Stick provides a development and prototyping platform for the LARA-R6 LTE Cat 1 module from u-blox. This version, LARA-R6401, is designed for North America, supporting both data and voice communication across major mobile networks including AT&T, Verizon, T-Mobile, and FirstNet. It features a nanoSIM card slot for network selection and includes common u-blox functionalities like uFOTA (over-the-air firmware updates), Root of Trust, secure boot/update, jamming detection, and antenna/SIM detection.
The board routes UART and I2S interfaces to a 0.1-inch spaced plated-through-hole (PTH) header, along with Reset and Power On signals, facilitating easy breadboard prototyping. It also includes two SMA connectors for primary and secondary antennas, and power can be supplied via USB-C or the VIN PTH pin.

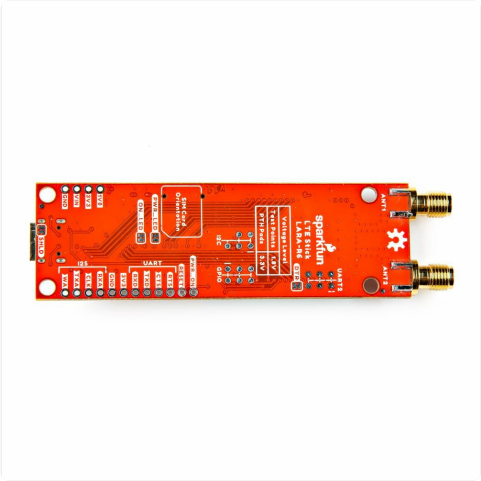
Product Overview



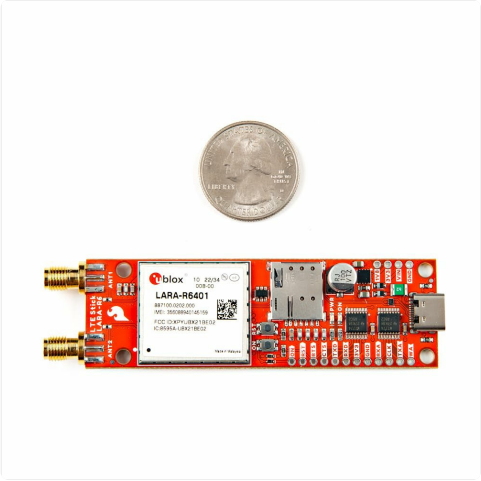
Top-down view of the SparkFun LTE Stick, showing the u-blox LARA-R6401 module, nanoSIM slot, and various components.



Angled view of the SparkFun LTE Stick, highlighting the two SMA antenna connectors and the USB-C port.



Bottom view of the SparkFun LTE Stick, showing the PTH connections for UART, I2S, Reset, and Power On signals.



Size comparison of the SparkFun LTE Stick with a US quarter, illustrating its compact form factor.

Setup

1. Power Supply

The SparkFun LTE Stick can be powered in two ways:

- **USB-C Connector:** This is the recommended power source. Connect a standard USB-C cable to the board and a power source (e.g., computer USB port, USB wall adapter).
- **VIN PTH Pin:** For advanced users, power can be supplied via the VIN plated-through-hole pin. The maximum input voltage for VIN is 6V. The board defaults to using the higher voltage input if both are connected.

2. SIM Card Installation

The board includes a nanoSIM card slot. Insert your nanoSIM card into the designated slot. Ensure the SIM card is oriented correctly as indicated on the board.
Note: Check with your network provider for compatibility with the LARA-R6 module.

3. Antenna Connection

The LTE Stick features two SMA connectors for antennas:

- **Primary Antenna (ANT1):** This antenna is used for both transmitting and receiving data.
- **Secondary Antenna (ANT2):** This antenna is receive-only.

Connect appropriate LTE antennas to these SMA connectors. For optimal performance, ensure both antennas are connected.

The SparkFun LTE Stick mounted on a breadboard, demonstrating typical prototyping setup with antennas and an additional microcontroller board.

4. Interfacing with Microcontrollers

The board provides PTH headers for easy connection to breadboards and microcontrollers:

- **UART Interface:** Primary communication interface for data.
- **I2S Interface:** For digital audio applications, enabling voice functionality.
- **Reset and Power On Signals:** Accessible via PTH for external control.

Test points are available for advanced users to solder to for the I2C interface, secondary UART, and four GPIO pins (IO1, IO2, IO3, and IO6). These test points are 1.8V only and are not level-shifted.

Operating Instructions

Basic Operation

1. Ensure the SIM card is properly inserted and antennas are connected.
2. Connect the USB-C cable to power the device. The power LED on the board should illuminate.
3. Use the UART interface to communicate with the LARA-R6 module via AT commands. Refer to the u-blox LARA-R6 series documentation for a comprehensive list of AT commands and their usage.
4. For voice applications, connect an audio codec, microphone, and speaker to the I2S interface and implement the necessary code on your microcontroller.

Firmware Updates (uFOTA)

The LARA-R6 module supports uFOTA (over-the-air firmware updates). Consult u-blox documentation for detailed procedures on performing firmware updates to ensure your module has the latest features and security enhancements.

Maintenance

- Keep the board clean and free from dust and debris.
- Avoid exposing the board to extreme temperatures or humidity.
- Ensure proper ventilation when operating for extended periods.
- Handle the board by its edges to prevent damage to components.
- Regularly check for and apply firmware updates as recommended by u-blox to maintain optimal performance and security.

Troubleshooting

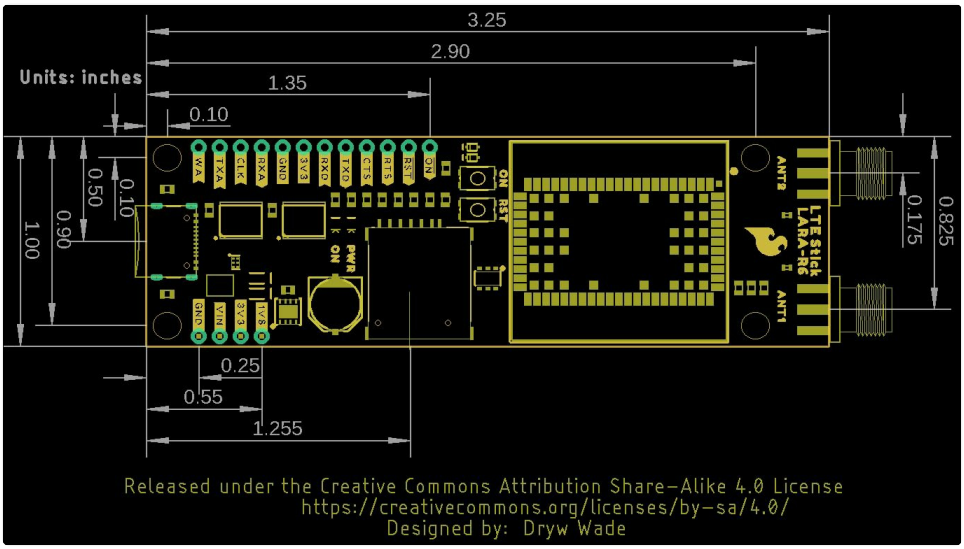
Problem	Possible Cause	Solution
Board not powering on.	Incorrect power supply; loose USB-C connection; VIN voltage out of range.	Ensure USB-C cable is securely connected and functional. Verify VIN voltage is within 3.3V-6V range if using PTH.
No network connection.	SIM card not inserted correctly; incompatible SIM card; antenna issues; network not supported.	Re-insert SIM card, ensuring correct orientation. Verify SIM card is active and compatible with LARA-R6. Check antenna connections. Confirm network support for LARA-R6 bands.
Communication issues via UART.	Incorrect baud rate; wiring errors; module not initialized.	Verify baud rate settings match the module's configuration. Check UART wiring for continuity and correct pin connections. Ensure the module is powered and initialized.
Voice functionality not working.	I2S wiring issues; audio codec not configured; software implementation errors.	Review I2S wiring. Ensure audio codec is correctly connected and configured. Debug software for proper I2S and voice handling.

Specifications

- **Module:** u-blox LARA-R6401 LTE Cat 1
- **Region:** North America
- **LTE FDD Bands:** 2, 4, 5, 12, 13, 14, 66, 71
- **Interfaces:**
    - 2x UART

- USB 2.0
- I2C
- 9 GPIO pins
- Digital Audio (I2S)

- **SIM Card Slot:** Nano SIM
- **Antenna Connectors:** 2x SMA (Primary: Transmit & Receive, Secondary: Receive Only)
- **Power Input:** USB-C (recommended) or VIN PTH pin (6V Max)
- **Operating Voltage:** 3.3V or 1.8V (for test points)
- **Dimensions:** 3.74 x 0.98 x 0.2 inches
- **Weight:** 8 ounces



Technical drawing showing the dimensions of the SparkFun LTE Stick in inches.

Support

For additional support, technical documentation, and community forums, please visit the official SparkFun website or the u-blox documentation portal for the LARA-R6 series.
SparkFun Store: Visit the SparkFun Store on Amazon