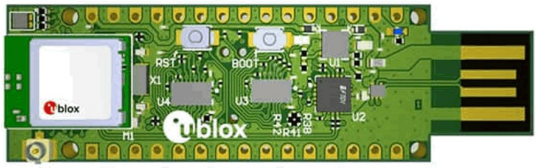
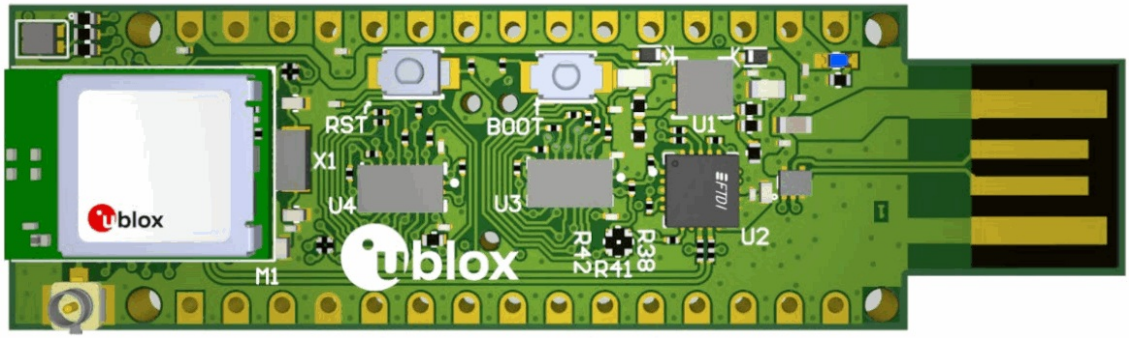


u-blox USB-NORA-W256 AWS IoT ExpressLink Multiradio Development Kit User Guide

USB-NORA-W256
AWS IoT ExpressLink Multiradio development kit
User guide



Abstract
This document describes how to set up and use the USB-NORA-W2 evaluation board for prototyping the NORA-W2 series with extremely low-powered Internet of Things (IoT) applications. It provides instructions for getting started with the evaluation board and includes a technical overview of the USB-NORA-W2 series modules.

Contents

Document information

Title	**USB-NORA-W256AWS**	
Subtitle	AWS IoT ExpressLink Multiradio development kit	
Document Type	User guide	
Document number	UBX-21045749	
Revision and date	R01	19-Nov-2021
Disclosure restriction	C1-Public	

This document applies to the following products:

Product name	Ordering code	Type number	Software version	IN/PCN reference
USB-NORA-W256AWS	USB-NORA-W256AWS	USB-NORA-W256-00	0.1	N/A

Introduction

The demonstrator USB-NORA-AWS evaluation kit comprises a small 16×22 mm evaluation board that conveniently exposes the supported interfaces of the NORA-W2 module that is mounted directly on the board. The board has a USB form factor and plugs directly into the USB port of your computer.

☞ This document explains how to set up the USB-NORA-W256AWS evaluation kit that includes the USB-NORA-W256AWS evaluation board and NORA-W2 module. Note that the module has not yet been provisioned in production for commercial use, which means that the provisioned security certificate and associated keys are not for use in production.

1.1 NORA-W2 series stand-alone modules

NORA-W2 stand-alone, multi-radio modules integrate a powerful 32-bit, dual-core microcontroller unit (MCU), and radio for wireless communication. The radio provides support for Wi-Fi 802.11b/g/n in the 2.4 GHz ISM band.
The embedded AWS IoT ExpressLink compliant software includes secured certificates that are pre-flashed in the modules. This allows the module to provide “out of the box” connectivity with Amazon Web Services (AWS) with no effort from the customer. It also supports secure Host and Firmware Over the Air (OTA) upgrades to sustain a high level of quality. Control and data communication is done through the module with stateless AT commands over a serial interface.
The Evaluation kit supports modification of the endpoint to your development account. In the commercial releases of this module, this endpoint is pre-defined to the u-box staging account and is managed through the ownership

transfer process through AWS Multi-Account Registration.
The NORA-W2 AWS IoT ExpressLink grants OEM ownership transferal through the AWS Multi-Account Registration (MAR) process. Fleet management, monitoring, and security auditing are supported by AWS IoT Device Management and AWS IoT Device Defender.
NORA-W2 includes the wireless MCU, flash memory, crystal, and components for matching, filtering, antenna, and decoupling, making it a very compact stand-alone multi-radio module. The module can be used to design solutions with top-grade security, thanks to integrated cryptographic hardware accelerators. This enables secure boot, which ensures the module boots up only in the presence of authenticated software. The small size and the embedded security capabilities make NORA-W2 ideal for critical IoT applications where security is important. Intended applications include consumer products, telematics, low-power sensors, connected factories, connected buildings (appliances and surveillance), point-of-sales, and health devices.
The NORA-W2 series is globally certified, and this reduces the time to market for the end product. To ensure operation in harsh professional environments, the modules are of a professional grade that is qualified according to ISO 16750 and supports an extended temperature range of –40 °C to +85 °C. See also the NORA-W2 series datasheet [1].

1.2 USB-NORA-AWS evaluation board

The u-Blox USB-NORA-W25xAWS[1] is a versatile development platform that allows quick prototyping of a variety of extremely low-powered Internet of Things (IoT) applications. The radio provides support for Wi-Fi 802.11 b/g/n in the 2.4 GHz ISM band and Bluetooth Low Energy 5.0[2].
USB-NORA-W25xAWS boards are available in the following two variants that accommodate alternative antenna options:

- USB-NORA-W251AWS, with NORA-W251AWS module pre-flashed with AWS IoT ExpressLink compliant software, and U.FL antenna connector for connecting an external antenna.
- USB-NORA-W256AWS, with NORA-W251AWS module pre-flashed with AWS IoT ExpressLink compliant software that includes an internal PCB antenna.

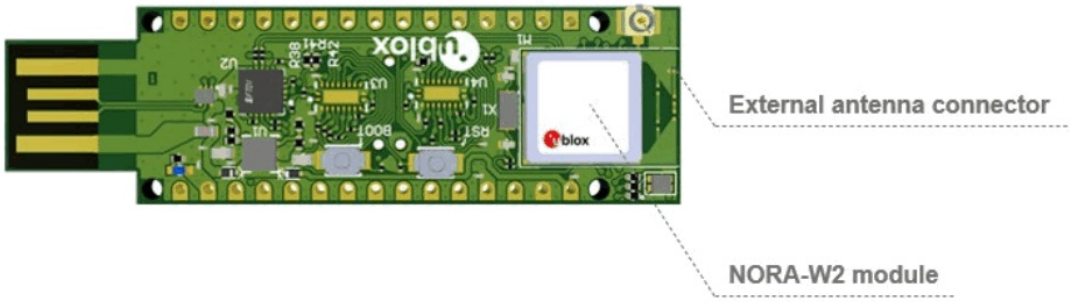


Figure 1: USB-NORA-W251AWS evaluation board (not yet available)

Figure 2: USB-NORA-W256AWS evaluation board

1.3 Kit includes

USB-NORA-W256AWS evaluation board with USB connector. The NORA-W2 module is mounted on the evaluation board.
With a USB Type A form factor, the USB-NORA-W256AWS evaluation board is inserted directly into the PC host. For more information, see also the **USB-NORA-W2 | u-blox**.

1. USB-NORA-W25xAWS refers to all antenna variants of the development kit.
2. Bluetooth Low Energy is currently not supported in the AWS IoT ExpressLink AT command manual [6].

1.4 User-provided items

Item	Description
PC	Computer with USB type A port
Wi-Fi Access Point/Router	Wi-Fi Access Point with public internet access. WPA, WPA2, or WPA3 Wi-Fi authentication must be supported.

Table 1: User-provided items

1.5 Purchasable third-party items
No additional items are required.

1.6 Key features

1.6.1 Pre-provisioned with AWS cloud
With the demonstrator USB-NORA-AWS evaluation kit, the user needs to manually register the device in their own AWS account. This manual process is only applicable to the demonstrator version of the evaluation board and is subject to change. The manual process of Registering an AWS IoT ExpressLink in your development account.

☞ The production release of the NORA-W256AWS module is provisioned with securely stored keys and certificates for secure connection to the AWS cloud during production. No module setup, apart from the verification of Wi-Fi credentials, is required to connect the end-product to the AWS cloud.

1.6.2 Simple integration with stateless commands
Communication from the host to the module is performed using a simple and easy-to-use AT-command set over a serial interface. The USB-NORA-W2 evaluation board is designed to conveniently insert into a computer USB port for prototyping and development.
For details about the supported commands, see also the AWS AT-command information on the AWS IoT ExpressLink developer page [4].

1.6.3 Wi-Fi 802.11b/g/n
USB-NORA-W2 communicates with the AWS Cloud over Wi-Fi 4.

1.6.4 Enhanced security features
The NORA-W2[3] module contains a multistage secure boot that ensures that the running software, as well as the hardware, is authentic. All provisioned certificates and keys are stored in the secure memory of the module and cannot be read or modified externally. NORA-W2 supports MQTT TLS 1.2 and Wi-Fi WPA, WPA2, and WPA3 authentication protocols for internet communication. The early demonstrator kits hosting the module have security limitations[4].

[3]NORA-W2 refers to the module mounted on the development board

[4]The NORA-W2 module included in the demonstrator version of the development board has temporary certificates and is not securely stored

Getting started

2.1.1 Setting up the host
Use the following procedure to set up the USB-NORA-W2 evaluation board on a host machine. Any operating system is supported that supports running a terminal application.

1. Connect USB-NORA-W256 to the host machine
2. Open a terminal application on your host machine, like TeraTerm for Windows or CoolTerm for Mac.
3. Select the port corresponding to the evaluation kit. Consult the documentation for your operating system to find out how to detect the port used by the evaluation kit.
4. Configure the terminal application as follows:

- Baudrate: 115200
- Bits: 8
- Parity: None
- Stop: 1
- Flow control: None
- Local Echo: Yes
- End of Line: Line Feed

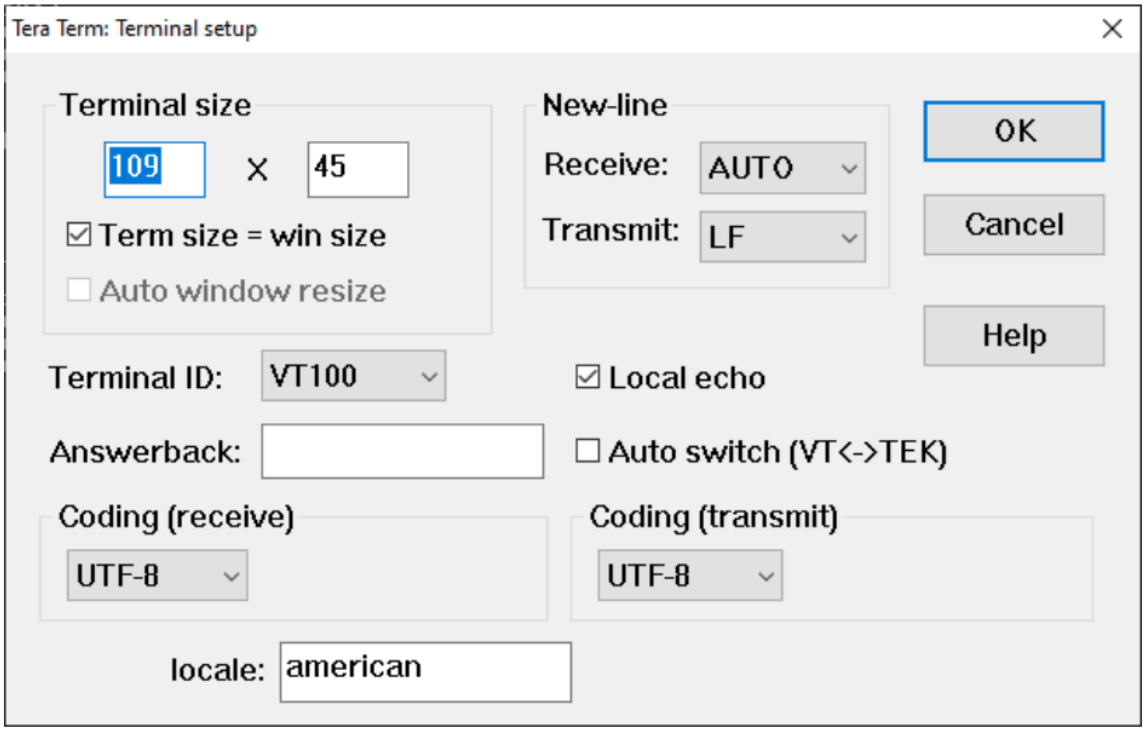


Figure 3: TeraTerm configuration example

2.1.2 Verifying evaluation board connection

Verify that you have a working connection to the evaluation board:

1. Open the terminal window
2. Type “AT” and press return.
3. Verify that an “OK” is written in the terminal windows, as shown in Figure 4. This confirms that the connected evaluation kit is successfully connected to your host machine.

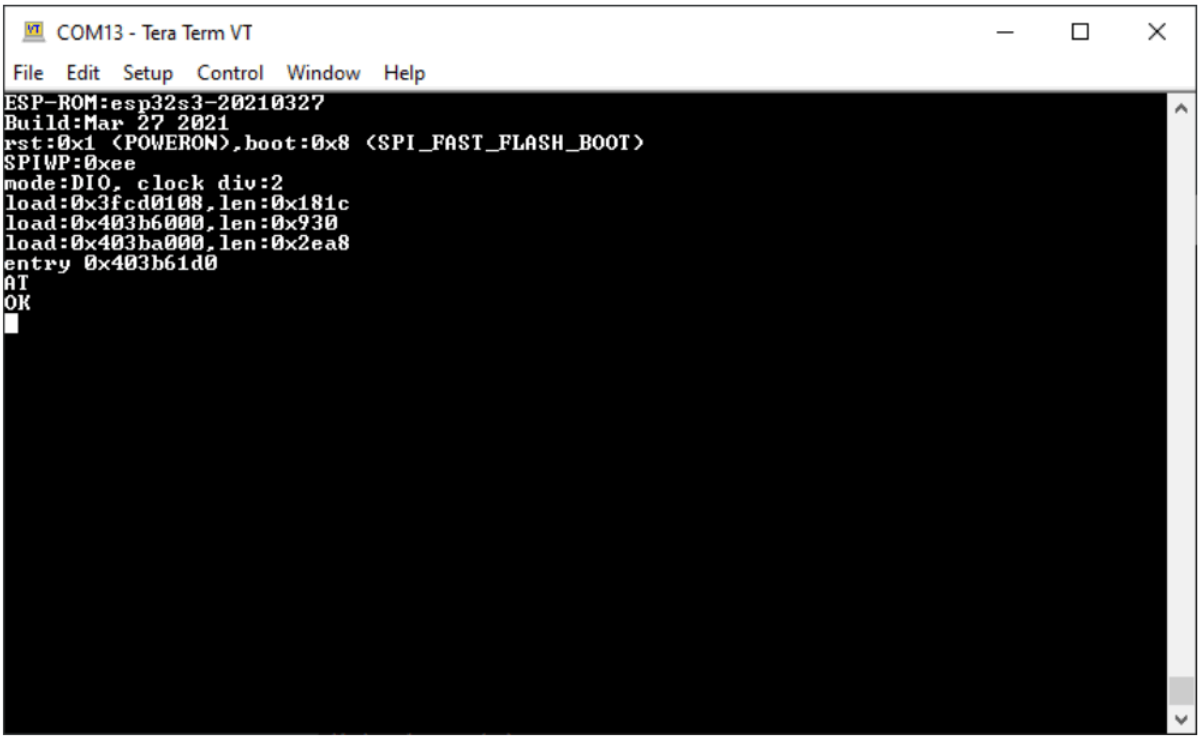


Figure 4: AT test command response and boot

☞ Keep the terminal open, as it is needed for Connecting and interacting with the AWS cloud and Troubleshooting.

2.1.3 AWS account and permissions for IoT development

Go to “Set up your AWS account” [2] and complete the following tasks:

- Sign up for an AWS account
- Create a user and grant permissions
- Open the AWS IoT console

See also Registering an AWS IoT ExpressLink in your development account.

Registering an AWS IoT ExpressLink in your development account

To create an IoT “Thing” and add it to your account you must retrieve the AWS IoT ExpressLink “Thing Name” and the corresponding certificate of the module. The “Thing name” is a sequence of characters that identifies the NORA-W2 module and its virtual cloud representation.
Follow the procedure below to register your development account using the AWS Management Console [5][51].

1. Open the AWS IoT Console.
2. Select Manage then select Things.
3. Choose to Create things, select Create single thing, and then click Next.
4. In the terminal application, type the command: AT+CONF. ThingName and copy the returned string (a sequence of alphanumeric characters) from the terminal.
5. On the Specify thing properties page, paste the copied string from the terminal into the Thing name under Thing properties on the console. Leave all other fields as default, then click Next.
6. In the terminal application, type the command: AT+CONF. Certificate
7. Copy the returned string (a longer sequence of alphanumeric symbols) and save the string as a text file called “ThingName.cert.pem” on your host machine.

8. On the Configure device certificate page, select Use my certificate and choose CA is not registered with AWS IoT.
9. Under Certificate, select Choose file and then double click on the “ThingName.cert.pem” file created in step 5.
10. Under Certificate Status, select Active.
11. Click Next to Attach policies to certificate.
12. On the Attach policies to the certificate page, select Create policy (opens a new window).
13. Include the policy name (e.g., IoTDevPolicy) and click Advanced mode.
14. Copy the following code snippet into the console.
    {“Version”: “2012-10-17”, “Statement”: [{“Effect”: “Allow”, “Action”: “*”,”Resource”: “*”}]}
15. Click Create to complete policy creation.
16. Close Create a policy window and return to Create single thing window.
17. Select the newly created IoTDevPolicy as policy.
18. Click Create thing to complete the Thing creation.
19. In the AWS IoT Console, choose Settings, and copy the “Endpoint” string of your account under Device data endpoint.
20. In the terminal application, type the following command for example:
    AT+CONF Endpoint=a3ixxxxxxxx7i2-ats.iot.eu-north-1.**amazonaws.com**

☞ The examples in this document are intended only for development environments. All devices in your production fleet must have credentials with privileges that authorize only intended actions on specific resources. The specific permission policies can vary for your use case. Identify the permission policies that best meet your business and security requirements. For more information, see also “Security best practices in AWS IoT Core” in the AWS documentation [6].
The steps described in the section use the “New console experience” of the AWS IoT Console.

3.1 Setting up and connecting to Wi-Fi

The USB-NORA-W256AWS evaluation board requires access to a local Wi-Fi router to connect to the internet. Enter the required security credentials and enter the following commands in your terminal application:
AT+CONF SSID=<your router SSID>
AT+CONF Passphrase=<your router passphrase>
☞ The SSID and passphrase of your local router are stored securely inside the AWS IoT ExpressLink module. While the SSID can be retrieved later (for debugging purposes and so on) any attempt to retrieve the Passphrase will return an error.

3.2 Validating the onboarding process

Having completed all previous steps in this chapter, enter the command AT+CONNECT in your Terminal application to validate the onboarding process, as shown in Figure 5.
OK CONNECTED confirm the successful connection with the cloud.

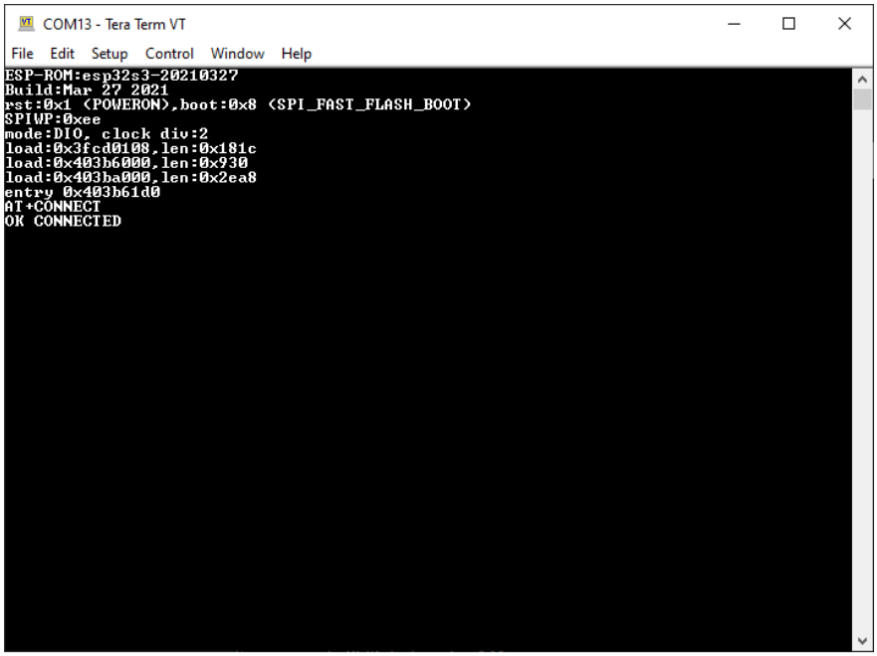


Figure 5: Successful CONNECTED

☞ You have now completed the registration of the evaluation kit as a Thing in your IoT account. As the AWS IoT ExpressLink remembers its configuration, the module automatically accesses your registered AWS account the next time you connect.

Connecting and interacting with AWS cloud

Use the MQTT client in the AWS IoT console to monitor the communication between your evaluation kit and the AWS Cloud.

1. Navigate to the AWS IoT console [3].
2. In the navigation pane, select Test and then MQTT Test Client to open the MQTT client.
3. In Subscribe to a topic, enter #. The multi-level wildcard subscribes and listens to all payloads published to your account.
4. Click Subscribe.

4.1 Connecting

In your terminal application, enter the command AT+CONNECT to establish a secure connection. OK, CONNECTED confirms successful connection to the cloud.

4.2 Send data to AWS cloud

To check communication with the MQTT test client:

1. In your terminal application, enter the command: AT+SEND /data Hello World! After a short delay, the terminal returns the prompt OK to confirm that the command has been sent.
2. Check that the message “Hello World!” is now displayed on the AWS IoT console under the topic “data”, as shown in Figure 6.

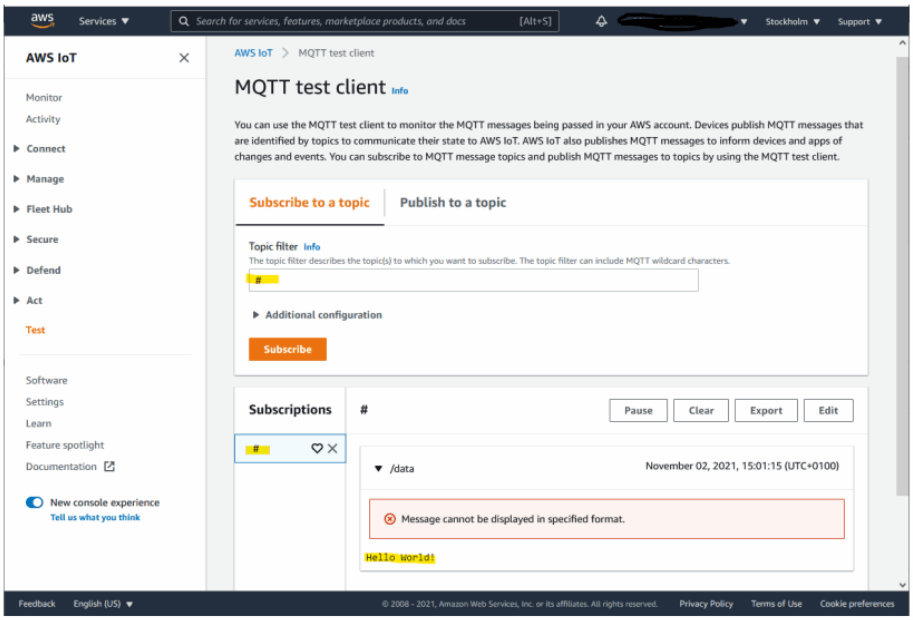


Figure 6: MQTT test client in AWS IoT console

4.3 Receiving data and commands from the AWS cloud

Use your terminal application and AWS IoT console to check the receipt of data and commands from the AWS cloud.
Enter the commands below in the terminal application to subscribe to a topic:

1. Enter the command AT+CONF Topic1=/MyTopic. After a short delay, the terminal returns the prompt OK to confirm that the command has been sent.
2. Enter the command AT+SUBSCRIBE1

   Enter the commands below in the AWS IoT console to publish a message on the same topic:
3. Select Publish to a topic
4. in the Topic name field, and type “MyTopic”.
5. Enter the text “Hello from the AWS IoT console” message then click “Publish”

   In the terminal application:
6. Enter the command AT+GET1. The message “OK Hello from the AWS IoT console” is returned at the prompt.

Troubleshooting

For common AT command issues, see the AWS IoT ExpressLink developer page [4].

Related Documentation

1. NORA-W2 series datasheet, **UBX-21046925**
2. Set up your AWS account, **https://docs.aws.amazon.com/iot/latest/developerguide/settingup.html**
3. AWS IoT ExpressLink main page, **https://aws.amazon.com/iot-expresslink**
4. AWS IoT ExpressLink developer page, **https://docs.aws.amazon.com/expresslink**
5. AWS Management Console, **https://aws.amazon.com/console/**
6. Security best practices in AWS IoT Core, **https://docs.aws.amazon.com/iot/latest/developerguide/security-best-practices.html**

www.u-blox.com.

Revision history

Revision	Date	Name	Comments
R01	19-Nov-2021	magj	Initial release for demonstrator variant

Contact
For complete contact information, visit us at www.u-blox.com.
u-blox Offices
North, Central, and South America
u-blox America, Inc.
Phone: +1 703 483 3180
Email: info_us@u-blox.com
Regional Office West Coast:
Phone: +1 408 573 3640
Email: info_us@u-blox.com
Technical Support:
Phone: +1 703 483 3185
Email: support_us@u-blox.com
Headquarters
Europe, Middle East, Africa
u-blox AG
Phone: +41 44 722 74 44
Email: info@u-blox.com
Support: support@u-blox.com
Regional Office Australia:
Phone: +61 3 9566 7255
Email: info_anz@u-blox.com
Support: support_ap@u-blox.com

Documents / Resources

	u-blox USB-NORA-W256 AWS IoT ExpressLink Multiradio Development Kit [pdf] User Guide USB-NORA-W256 AWS, IoT ExpressLink Multiradio Development Kit, Multiradio Development Kit, USB-NORA-W256 AWS, Development Kit

References

- Roblox
- Home | u-blox
- AWS Management Console
- Quickly Develop Secure IoT Devices | AWS IoT ExpressLink | Amazon Web Services
- Security best practices in AWS IoT Core - AWS IoT Core