

AW-CU427-USB

IoT Connectivity Evaluation Board for AWS IoT Core

Getting Started Guide

Rev. 0.2

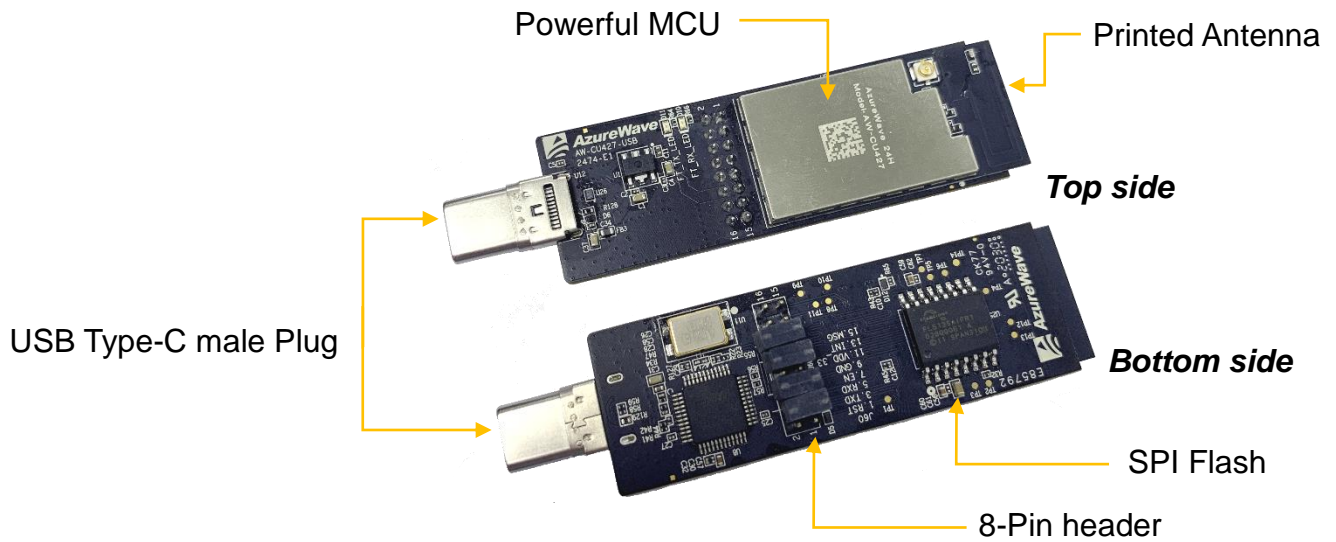
Revision History

Version	Revision Date	Description	Initials	Approved
0.1	2021/01/14	Initial version	Steven Jian Jackson Boon Josh Lin	Chihhao Liao Patrick Lin
0.2	2021/10/28	Add introduction of “Over-the-Air Updates”	Josh Lin	Patrick Lin

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1. Overview of AW-CU427-USB



2. Hardware Setup

2.1 Components

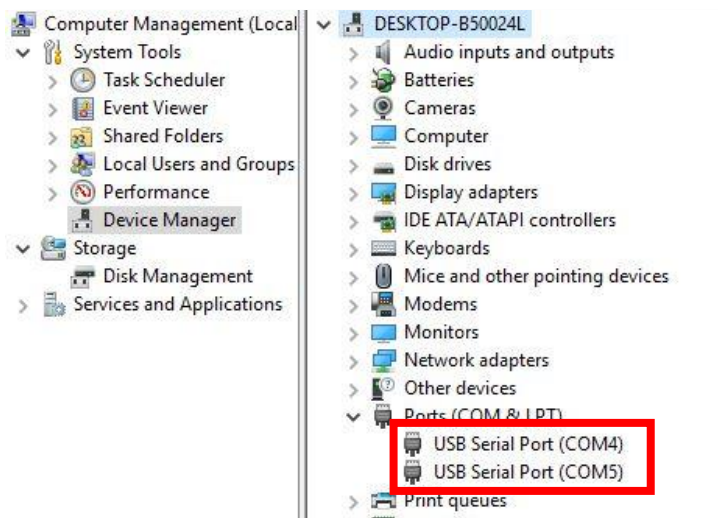
- Plug the AW-CU427-USB dongle into the USB type C port or through an USB type A male to USB type C female cable (not included in the box) if the computer does not have the USB type C port or it can not recognize the dongle



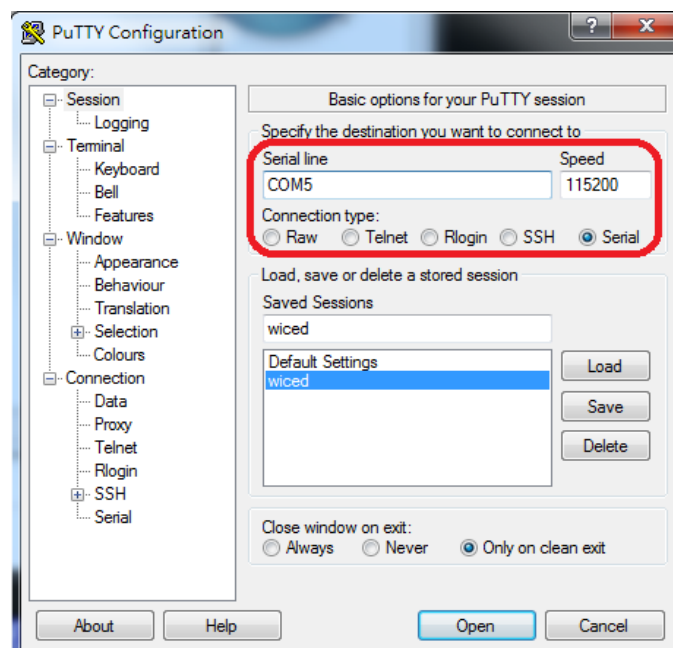
2.2 Identify the Hardware and Firmware

- The simple way to identify the hardware and firmware of AW-CU427 is under Windows. You also can identify it under Linux.

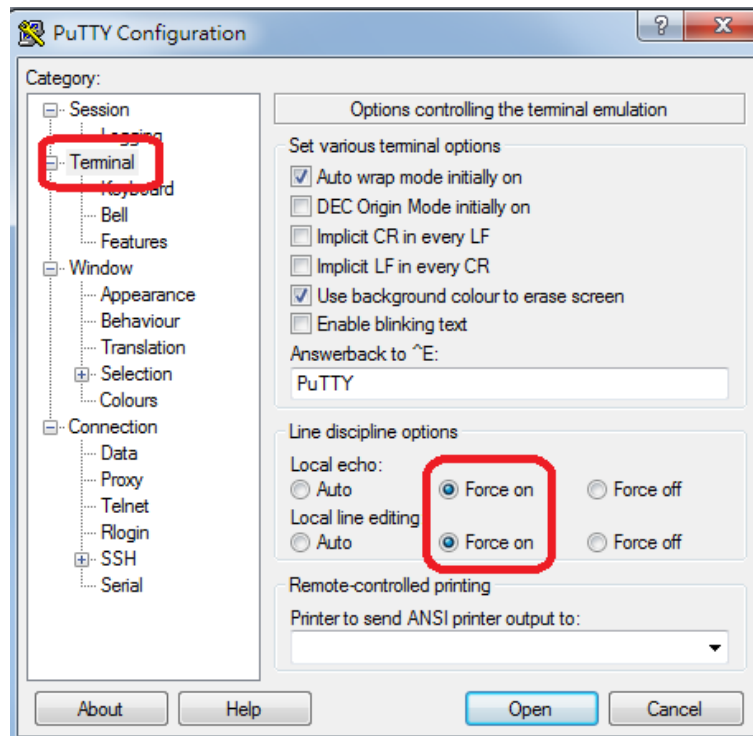
Check if Device Manager can recognize AW-CU427-USB. If not, download FTDI Driver at <https://www.ftdichip.com/Drivers/VCP.htm>, then send the AT commands through the second FTDI com port



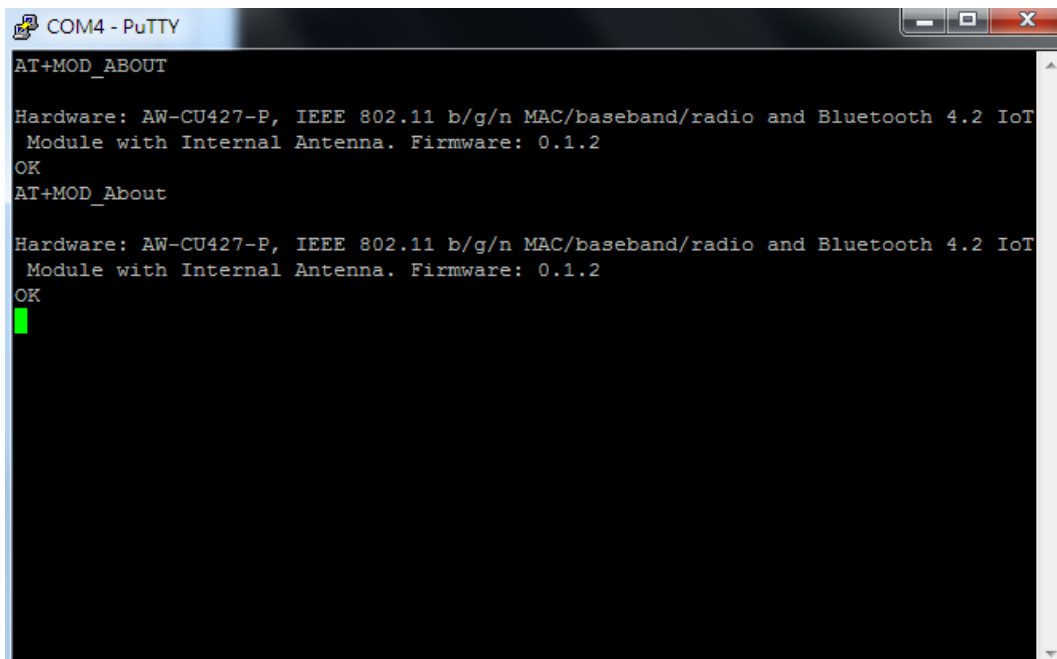
- Open a serial connection by using PuTTY or the similar terminal emulator



- To force the terminal show characters you type and send the command only after you hit the “Enter” key, set Local echo & Local line editing to “Force on”



- Type **AT+MOD_About** and hit “Enter” key to identify the dongle hardware and firmware



2.3 Antenna Installation Guide

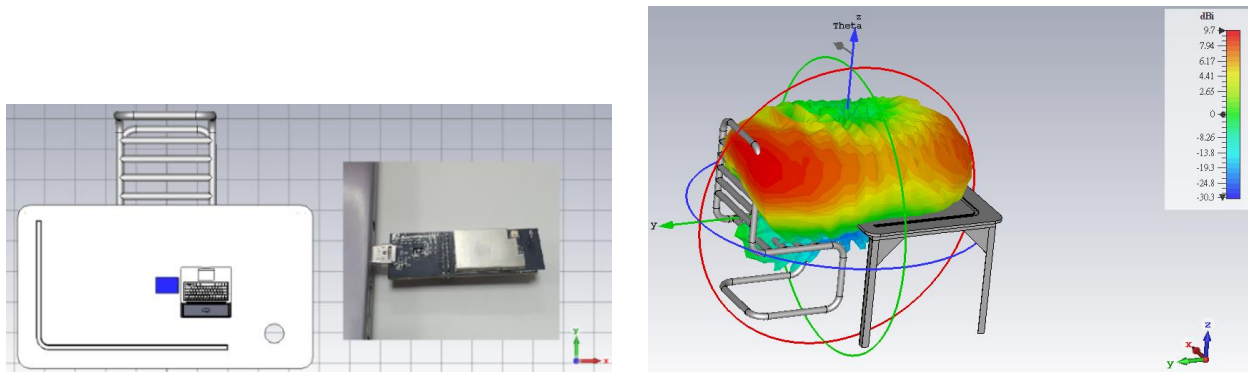
The AW-CU427-USB includes an integrated omnidirectional antenna. Hence, the dongle can be seen as an antenna.

Objects close to the antenna (the dongle) become new sources for radiation from far field perspective. This can be a problem if those objects are electrically large. Recommended minimum clearance is 20mm for conductive materials and 10mm for non-conductive materials. Failing to meet the clearance requirements will detune the antenna and the radiation pattern may not be omnidirectional.

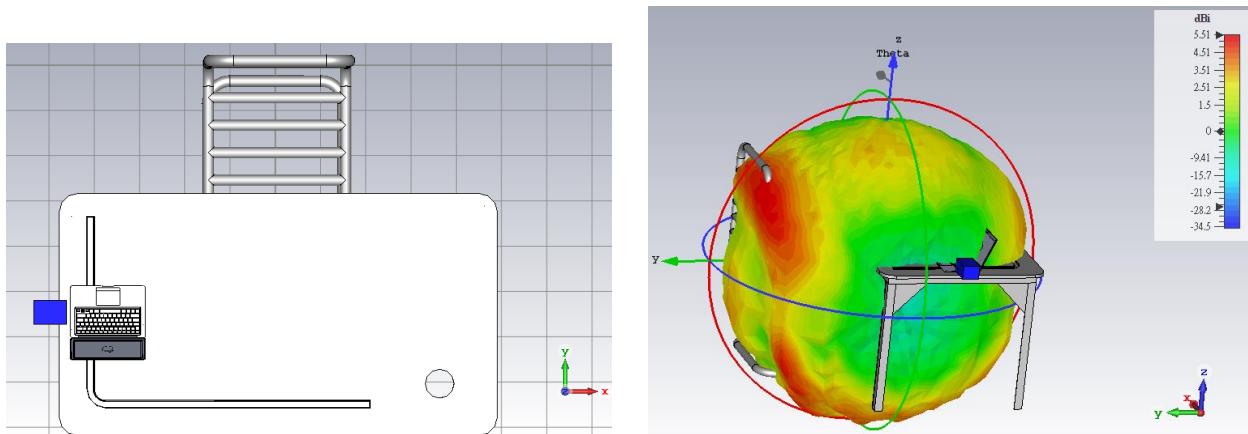
Use AT command **AT+WIFI_On** and **AT+WIFI_Scan** to check if the RSSI (Received Signal Strength Indication) is good ($>-65\text{dBm}$) or not. If not, adjust the setup until the RSSI $>-65\text{dBm}$.

The examples below are antenna radiation patterns with different setups:

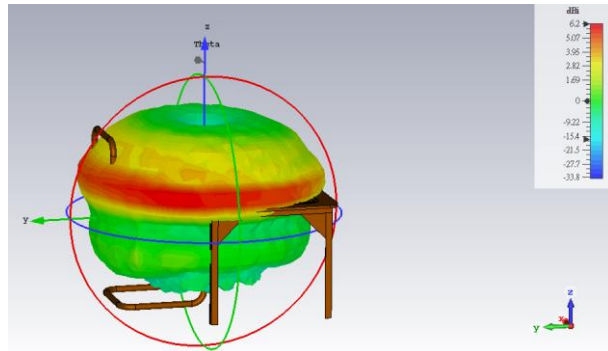
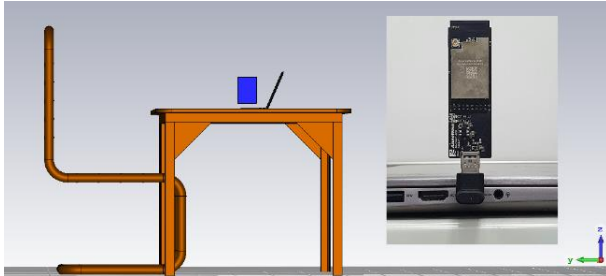
- Steel Desk & Chair + Horizontal Position



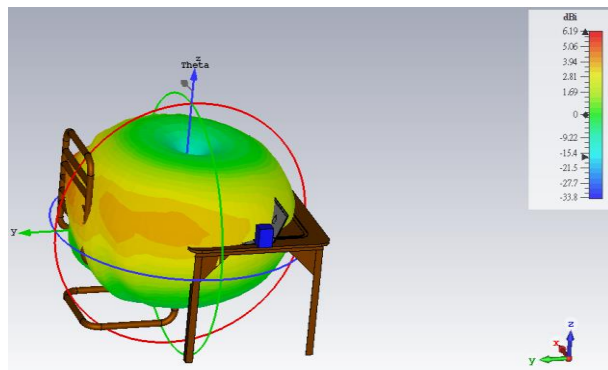
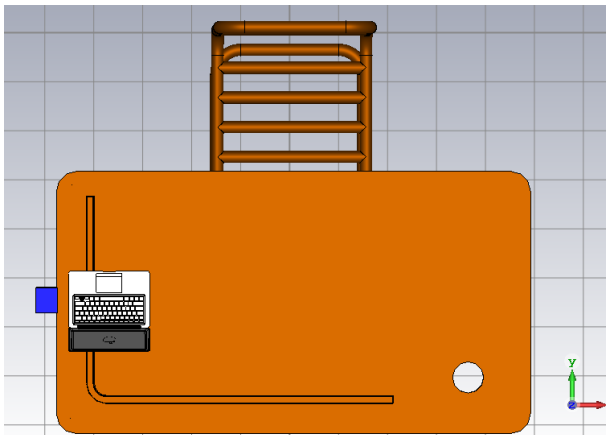
- Steel Desk & Chair + Horizontal Position + Close to Desk Edge



- Wood Desk & Chair + Vertical Position



- Wood Desk & Chair + Vertical Position + Close to Desk Edge



3. AWS Command Example

Please find the command details in **AWS CONNECTOR AT Command Set**.

Below are commands for the demo:

1. Turn on Wi-Fi module: **AT+WIFI_On**
2. Retrieve the Wi-Fi AP / Station Mode: **AT+WIFI_GetMode**
3. Perform a Wi-Fi network scan: **AT+WIFI_Scan**
4. Set and store the Wi-Fi AP information when AW-CU427-USB in Station Mode:

AT+WIFI_SetAP=SSID,password,security type

SSID: SSID of AP (case sensitive)

password: password for AP (case sensitive)

security type: OPEN | WEP | WPA | WPA2

5. Connect to the AP: **AT+WIFI_Connect**
6. Define and store Thing-specific configuration:

AT+THING_Set=client ID,endpoint,client certificate,client private key

client ID: Thing name(Client ID)

endpoint: AWS IoT endpoint URL

client certificate: Certificate for this Thing

client private key: Private key for this Thing

7. Connect the client to MQTT broker: **AT+MQTT_Connect**
8. Subscribe to and save MQTT topic: **AT+MQTT_Subscribe=<topic>,<qos>**
9. Publish to MQTT topic:

AT+MQTT_Publish=topic,message,qos

topic: Topic to publish to

message: Message to publish

qos: 0 | 1

3.1 Getting Started with AWS IoT Core

Step 0: The below link is a documents of how to setup AWS IOT, you can refer to it for full AWS IOT knowledge.

<https://docs.aws.amazon.com/iot/latest/developerguide/iot-gs.html>

But, if you want to setup AzureWave AWS Connector, you would just refer to the following steps.

Step 1: Create AWS Account, Create an IAM user.

Please refer to the below link to setup AWS Account and IAM user.

<https://docs.aws.amazon.com/iot/latest/developerguide/setting-up.html>

If you have created an IAM user, please refer to the following setting to connect these two policies (AmazonFreeRTOSFullAccess, AWSIoTFullAccess) to your IAM.

<https://docs.aws.amazon.com/freertos/latest/userguide/freertos-account-and-permissions.html>

Step 2: Create a thing.

A thing represents a specific device or instance that can communicate with AWS IOT.

Please refer to the following link to create a thing.

<https://docs.aws.amazon.com/iot/latest/developerguide/create-aws-thing.html>

Step 3: Register a device

This step will create certificate and private key. You can use certificate, private key, thing name and endpoint as **AT+THING_Set** command parameter. After this command executing, the four parameter will be provision to our connector. After provisioning, you can connect to AWS IOT with MQTT or SHADOW operation.

Please refer to the steps at the following link.

<https://docs.aws.amazon.com/iot/latest/developerguide/register-device.html>

After finishing the steps, please notice the following two actions:

- Download certificate and private key

In Create and activate a device certificate chapter, please download and keep the certificate and private key. Because they will be used when sending the **AT+THING_Set** command.

Certificate created!

Download these files and save them in a safe place. Certificates can be retrieved at any time, but the private and public keys cannot be retrieved after you close this page.

In order to connect a device, you need to download the following:

A certificate for this thing	853e49e35f.cert.pem	Download
A public key	853e49e35f.public.key	Download
A private key	853e49e35f.private.key	Download

You also need to download a root CA for AWS IoT:

A root CA for AWS IoT [Download](#)

[Activate](#)

- Thing Name and Endpoint

These two data will also be used for **AT+THING_Set** command.

You can find out thing name in Manage > Things submenu, and endpoint in settings of AWS IOT Console at console.aws.amazon.com/iot.

AWS IoT X

Monitor

Activity

► Onboard

▼ Manage

Things

Types

Thing groups

Billing groups

Jobs

Tunnels

► Greengrass

► Secure

► Defend

► Act

Test

Software

Settings

Learn

AWS IoT > Things

Things

Create

Search things

Q

Fleet Indexing

Info

<input type="checkbox"/> Name	Type	
<input type="checkbox"/> 98c6	NO TYPE	...

AWS IoT

Monitor

► Onboard

► Manage

► Greengrass

► Secure

► Defend

► Act

Test

Software

Settings

Learn

Settings

Custom endpoint

ENABLED

This is your custom endpoint that allows you to connect to AWS IoT. Each of your Things has a REST API available at this endpoint. This is also an important property to insert when using an MQTT client or the AWS IoT [Device SDK](#).

Your endpoint is provisioned and ready to use. You can now start to publish and subscribe to topics.

Endpoint

ats.iot.us-east-2.amazonaws.com

Logs

ENABLED

You can enable AWS IoT to log helpful information to CloudWatch Logs. As messages from your devices pass through the message broker and the rules engine, AWS IoT logs process events which can be helpful in troubleshooting.

Role

Craig

Level of verbosity

Error

Edit

3.2 Publish and Monitor MQTT message on the cloud

Step 0: Make sure the AP under test is connected to the internet using other Wi-Fi enabled devices. Assume the SSID, password and security type of the AP is MySSID, MyPassword, wpa2.

Step 1: Connect the AW-CU427-USB to the system (refer to [2. Hardware Setup](#)) and turn off the wireless devices near the AW-CU427-USB (except for the device under test). Turn on the Wi-Fi module of the AW-CU427-USB using **AT+WIFI_On**

Step 2: Check if AW-CU427-USB is in station mode using **AT+WIFI_GetMode**

Step 3: Set and store information of the AP using **AT+WIFI_SetAP=MySSID,MyPassword,wpa2**

AT+WIFI_SetAP=SSID,password,security type

SSID: SSID of AP (case sensitive)

password: password for AP (case sensitive)

security type: OPEN | WEP | WPA | WPA2

Step 4: Connect to the AP: **AT+WIFI_Connect**

Step 5: Define and store Thing-specific configuration using **AT+THING_Set** command

AT+THING_Set=client ID,endpoint,client certificate,client private key

client ID: Thing name(Client ID)

endpoint: AWS IoT endpoint URL

client certificate: Certificate for this Thing (downloaded in 3.1 step 3)

client private key: Private key for this Thing (downloaded in 3.1 step 3)

You should create command as format below:

```
AT+THING_Set=98c6, a3qjEXAMPLEffp-ats.iot.us-east-1.amazonaws.com, -----BEGIN
CERTIFICATE-----\n...base64 data...\n-----END CERTIFICATE-----\n, -----BEGIN RSA
PRIVATE KEY-----\n...base64 data...\n-----END RSA PRIVATE KEY-----\n
```

Note: **a3qjEXAMPLEffp** is just an example endpoint, your endpoint URL should replace it. Please follow the instructions to find the endpoint.

- Navigate to the AWS IoT console
- Choose Settings in the navigation pane
- The endpoint can be found under Custom endpoint

Step 6: Connect the client to MQTT broker: **AT+MQTT_Connect**.

Step 7: Subscribe to and save MQTT topic using **AT+MQTT_Subscribe=iotdemo/1,0**

Step 8: Publish to MQTT topic using **AT+MQTT_Publish=iotdemo/1, hello, 0**

AT+MQTT_Publish=topic,message,qos

topic: Topic to publish to

message: Message to publish

qos: 0 | 1

Step 9: Use the MQTT client in the AWS IoT console to monitor the messages that device sends to the AWS Cloud.

Sign in to the AWS IoT console.

<https://console.aws.amazon.com/iotv2/>

In the navigation pane, choose **Test** to open the MQTT client.

In **Subscription topic**, enter **iotdemo/#**, and then choose **Subscribe to topic**.

You should see the message send from device as like below.



3.3 Over-the-Air Updates

This section describes how to setup OTA on AWS server side and how to create an OTA job for our AWS connector to update firmware.

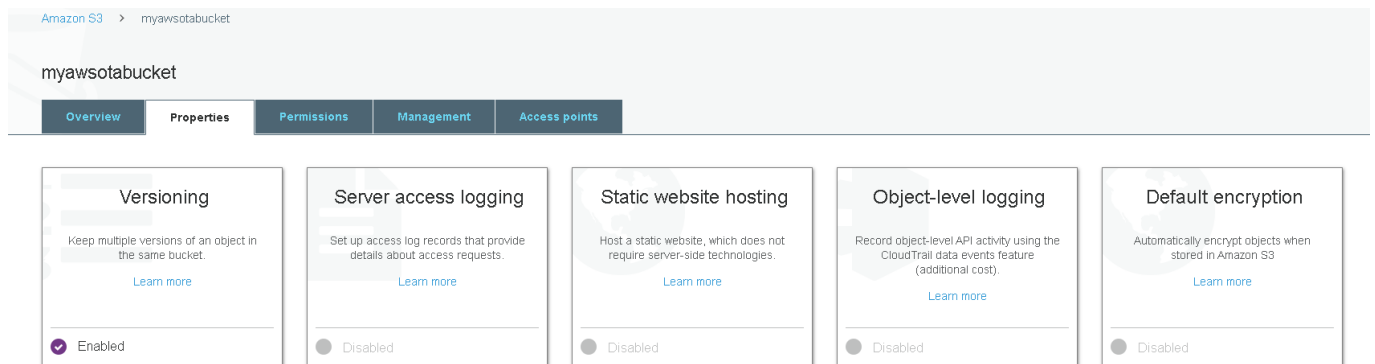
The first three steps describe what requirements of OTA on AWS server side you have to setup. The last step describes how to create an OTA job.

Create S3 bucket to store update.

AWS S3 is an object storage service and we will put update firmware in it.

Please reference <https://docs.aws.amazon.com/freertos/latest/userguide/dg-ota-bucket.html>

Note: Please make sure you have enable versioning on you S3 bucket setting.



Create Service Role and Policy.

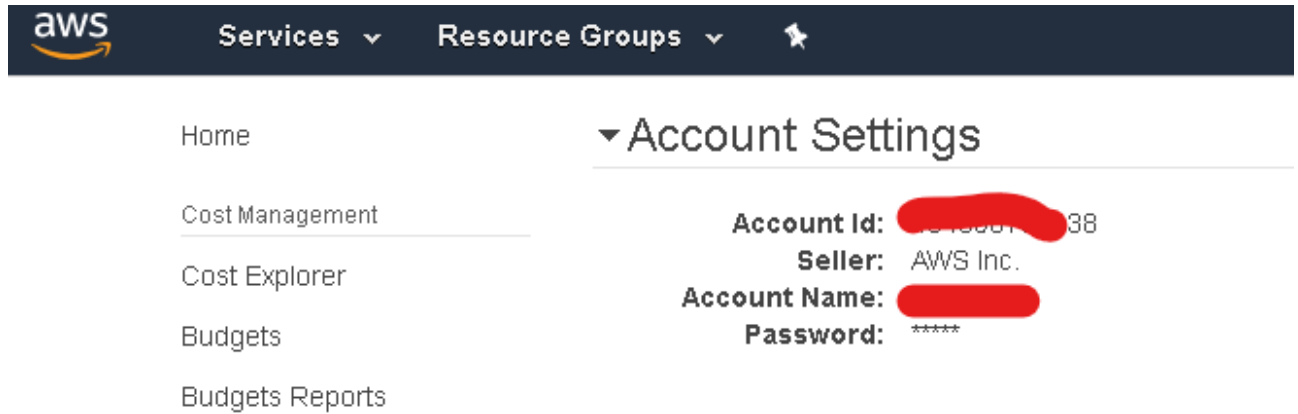
This section will describe how to setup Role and Policy to have right to access AWS S3 storage.

- Service Role
Please reference

<https://docs.aws.amazon.com/freertos/latest/userguide/create-service-role.html>

If you want to find out your Account id, please enter the following link.

<https://console.aws.amazon.com/billing/home?#/account>



- User Policy
Please reference

<https://docs.aws.amazon.com/freertos/latest/userguide/create-ota-user-policy.html>

Create code-signing certificate

Because there are several configures in this topic, please use the following link to complete code-signing certificate.

<https://docs.aws.amazon.com/freertos/latest/userguide/ota-code-sign-cert-win.html>

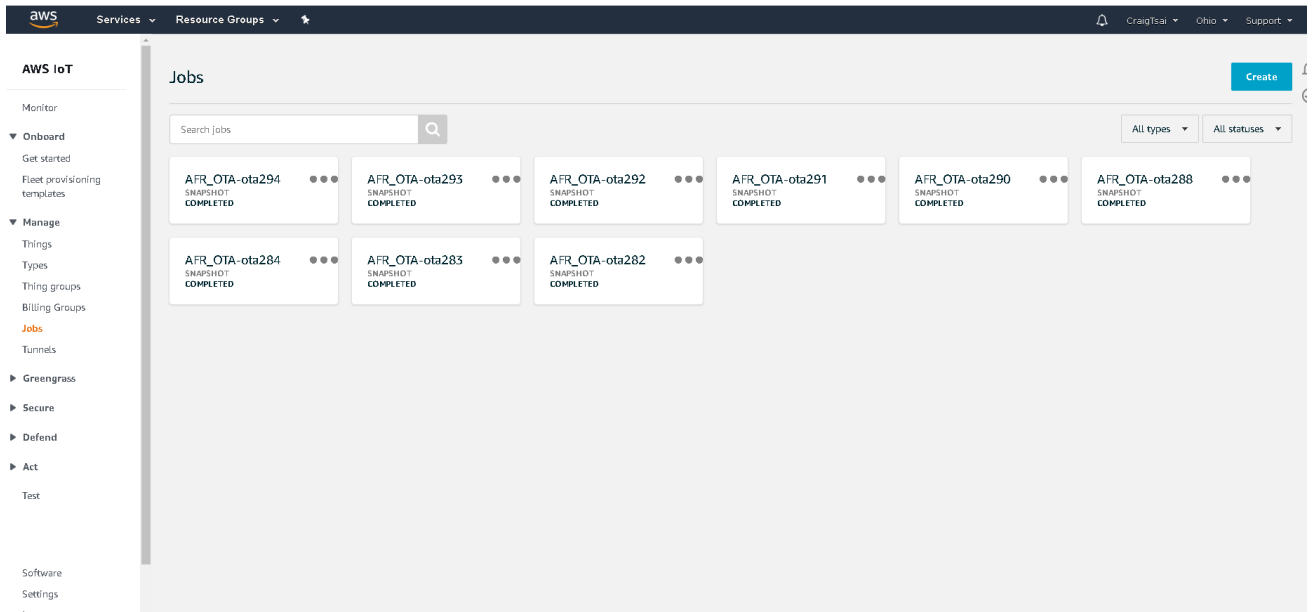
AWS CLI and openssl are necessary softwares to complete this task.

Create OTA update Job

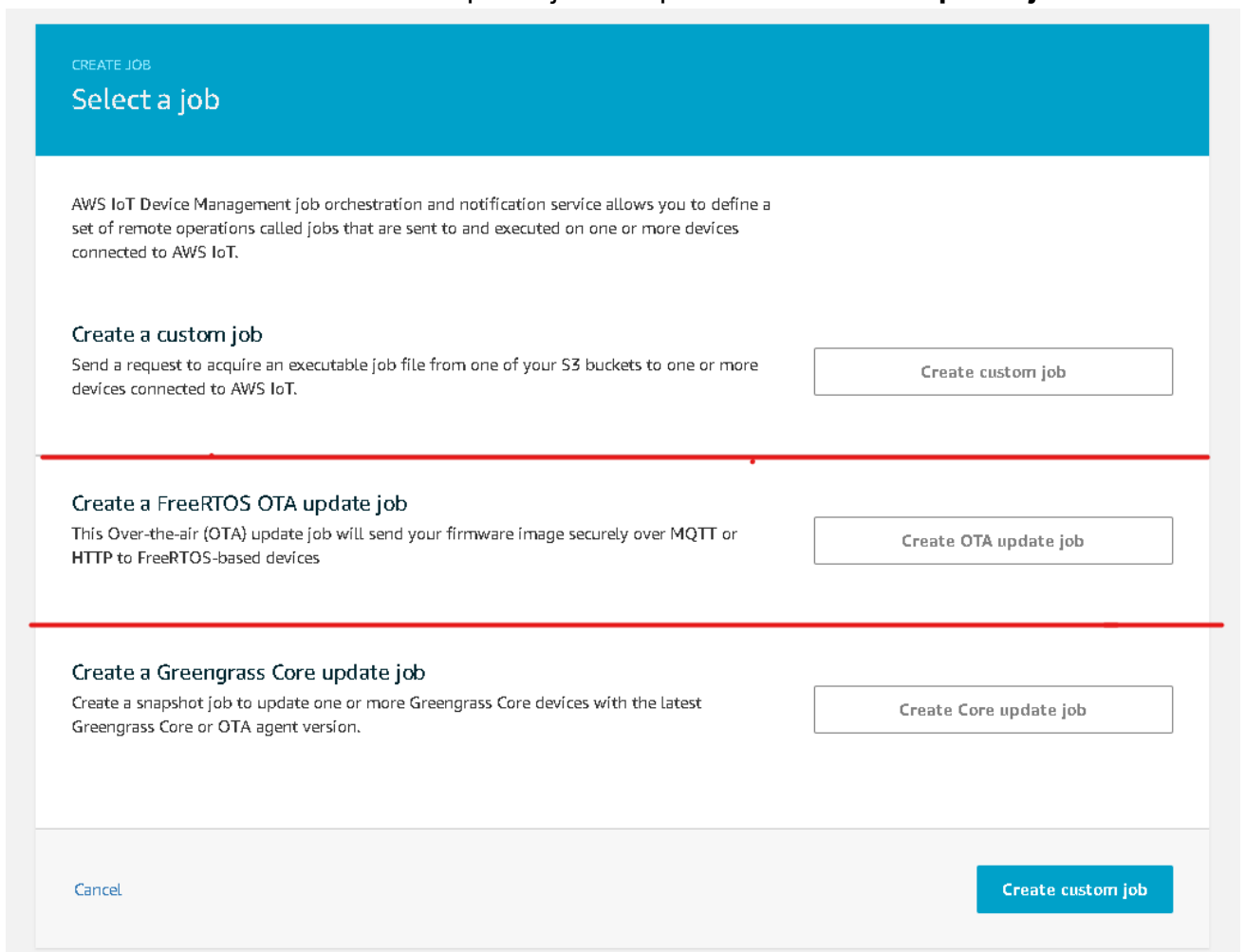
After all prepared procedure finished, you can create an OTA update job on this thing name and use AT+MOD_OTA command to trigger OTA update procedure.

1. Create OTA Job

Please enter AWS IOT console, choose Manager, and press Jobs and then press Create button.



2. Please choice a FreeRTOS OTA update job and press “create OTA update job”



3. Select a Things to create OTA job and then press NEXT

CREATE JOB

Create a FreeRTOS OTA update job

This Over-the-air (OTA) update job will send your firmware image securely over MQTT or HTTP to FreeRTOS-based devices.

Select devices to update

Browse and select the devices you want to include in this job.

1 thing(s) and 0 thing group(s) selected.

Close

Things	Thing groups	Summary
<input type="text"/>		
<input type="checkbox"/>	test	
<input type="checkbox"/>	AICC-DT-0f677f	
<input type="checkbox"/>	AICC-DT-ea1833	
<input type="checkbox"/>	AICC-DT-09b8cd	
<input type="checkbox"/>	AICC-DT-6fe4f8	
<input type="checkbox"/>	AICC-DT-dc8305	
<input type="checkbox"/>	AICC-DT-1be885	
<input checked="" type="checkbox"/>	AZ-IOT	

Cancel

Back

Next

4. On next page, please only select **MQTT** to be update protocol and select **Sign a new firmware for me**. Then choose the **code signing profile** we create on previous chapter. After that, you can select a exist firmware or upload a new image from local.

CREATE JOB

Create a FreeRTOS OTA update job

Select the protocol for firmware image transfer

HTTP and MQTT protocols are supported for firmware updates. [Learn more](#)

- ☐ HTTP [?](#)
- ☒ MQTT

Select and sign your firmware image

Code signing ensures that devices only run code published by trusted authors and that the code has not been altered or corrupted since it was signed. You have three options for code signing. [Learn more](#)

- ☒ Sign a new firmware image for me
- ☐ Select a previously signed firmware image
- ☐ Use my custom signed firmware image

Code signing profile [Learn more](#)

myotasign	SHA256	ECDSA	/home/craig/workspac...	Clear	Change
-----------	--------	-------	-------------------------	-----------------------	------------------------

Select your firmware image in S3 or upload it

[←](#) [S3 / myawsotabucket /](#) [Upload an image](#) [Refresh](#) [Close](#)

SignedImages/	US-EAST-2	>
<u>aws_demo_011.bin</u>		Select
aws_demos.bin		Select
aws_demos_093.bin		Select

Then, please enter slash in **Pathname of firmware image on device** and choose the **Role** we create on previous chapter. Then press NEXT button.

Pathname of firmware image on device [Learn more](#)

/

IAM role for OTA update job

Choose a role which grants AWS IoT access to the S3, AWS IoT jobs and AWS Code signing resources to create an OTA update job. [Learn more](#)

Role (requires S3 access)

Craig

Select

[Cancel](#)

Back

Next

5. Entering a **unique ID** in ID field. You can't use the same ID you created before. Other fields just keep default setting and press Create button.

CREATE JOB

Create a FreeRTOS OTA update job

ID

ota293

Description (optional)

Give your job a helpful description

Job type

A job can run on the devices and/or groups selected, or remain open, and apply to devices later added to a group.

☒ **Your job will complete after deploying to the selected devices/groups (snapshot)**

☐ **Your job will continue deploying to any devices added to the selected groups (continuous)**

Job executions rollout configuration - optional

Specify how quickly devices will be notified of a pending job execution. [?](#)

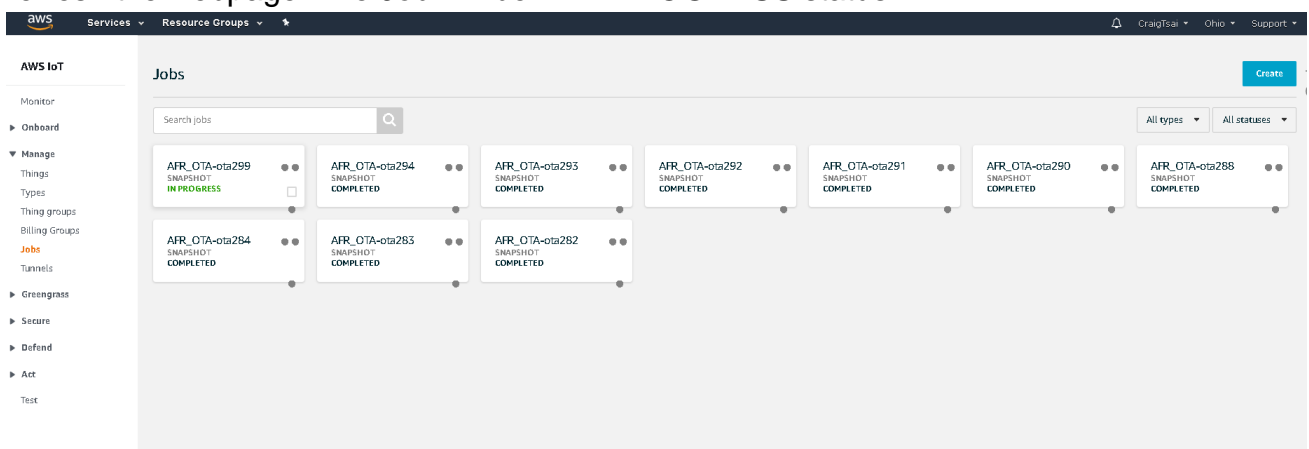
☒ **Constant rate**

☐ **Exponential rate**

Maximum per minute (1-1000)

1000

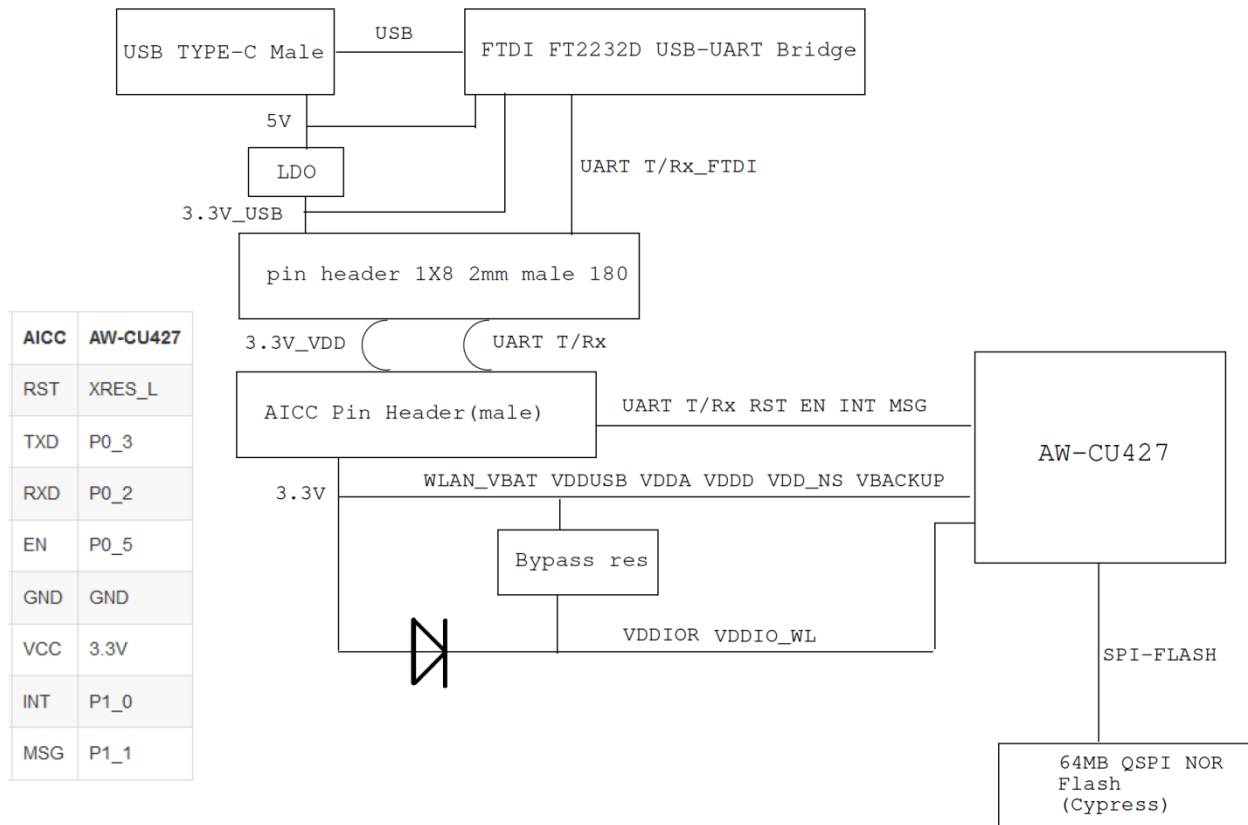
6. Finally, you can see a job to be created on Jobs page. If you don't see it, please press f5 to refresh the webpage. The Job will be in IN PROGRESS status.



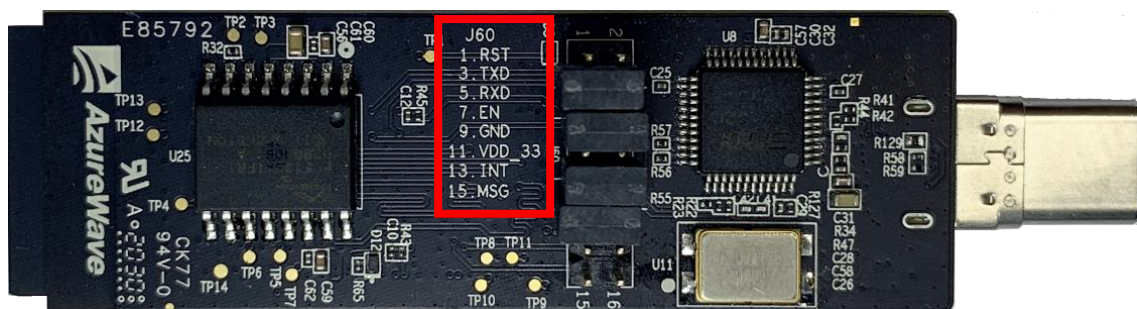
The screenshot shows the AWS IoT Jobs page. On the left is a navigation sidebar with options like Monitor, Onboard, Manage, Thing groups, Jobs (selected), Tunnels, Greengrass, Secure, Defend, Act, and Test. The main area is titled 'Jobs' and contains a search bar and a grid of job cards. The first card, 'AFR_OTA-ota299', has a green 'IN PROGRESS' status. The other seven cards, 'AFR_OTA-ota294' through 'AFR_OTA-ota288', all show a grey 'COMPLETED' status. There are filter buttons for 'All types' and 'All statuses' on the right.

4. Block Diagram and Schematic

4.1 Block Diagram for AW-CU427-USB

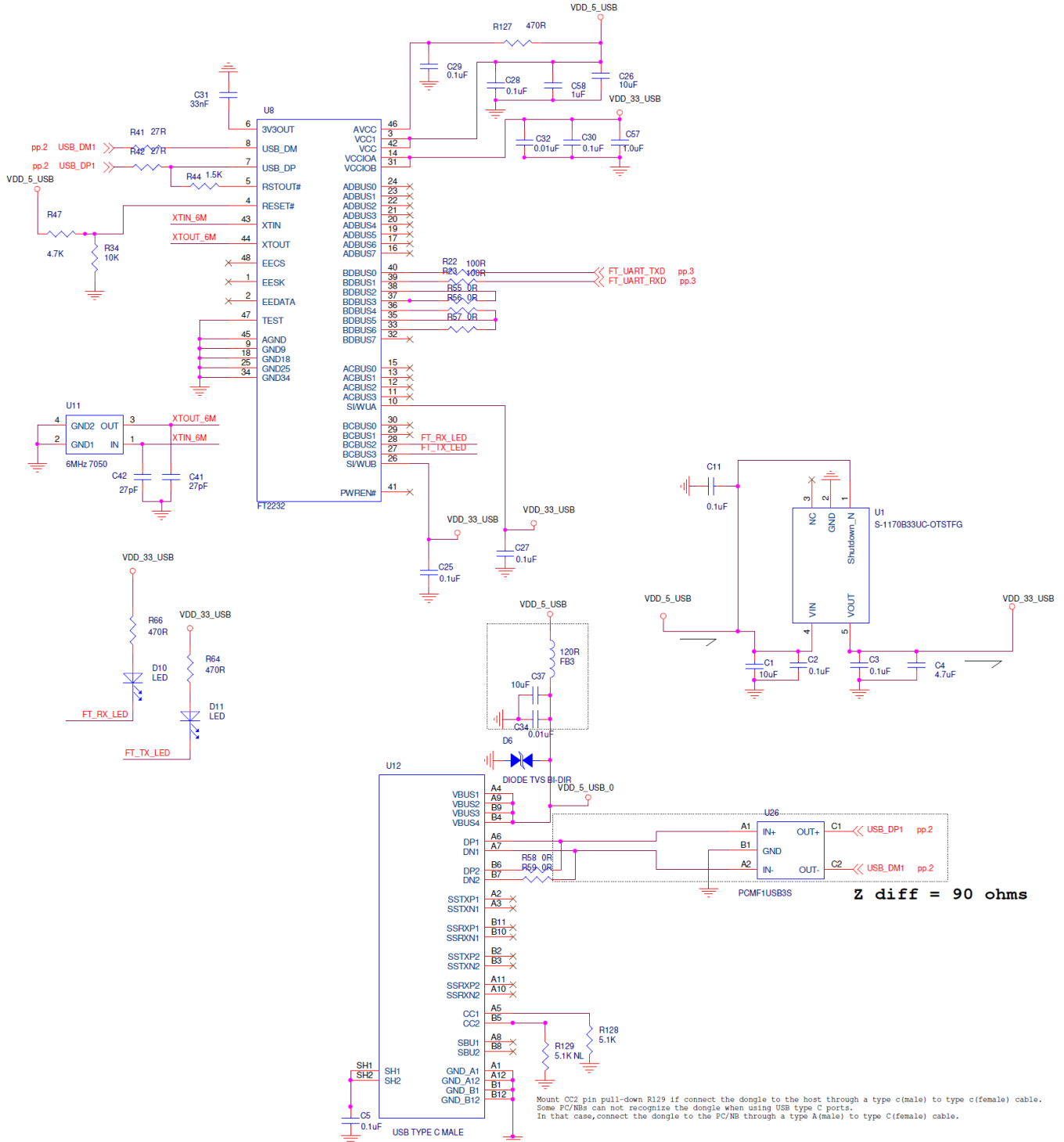


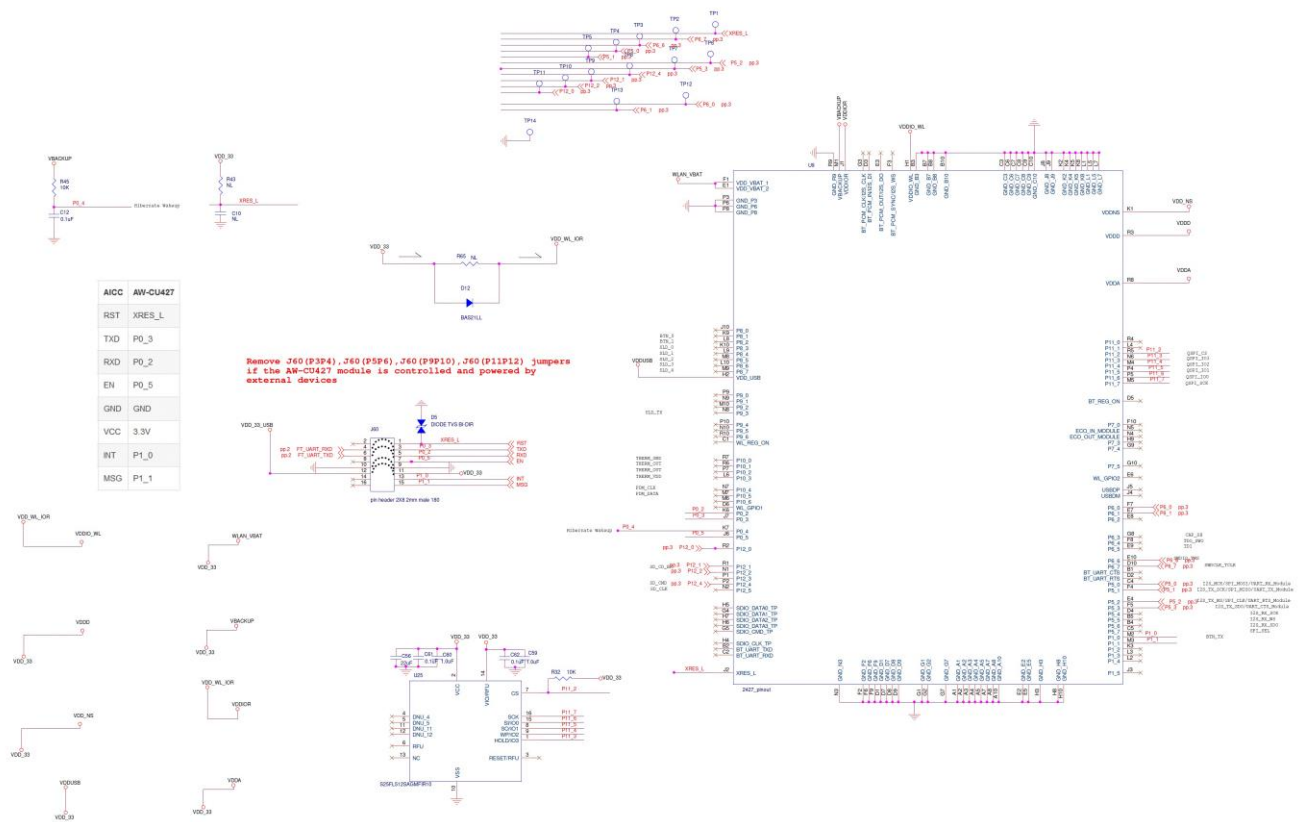
Pin Name (J60) is also shown on the bottom of PCBA



4.2 Schematics for AW-CU427-USB

FTDI Bridge (USB to UART/JTAG)





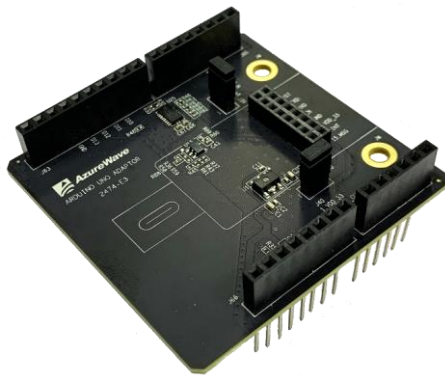
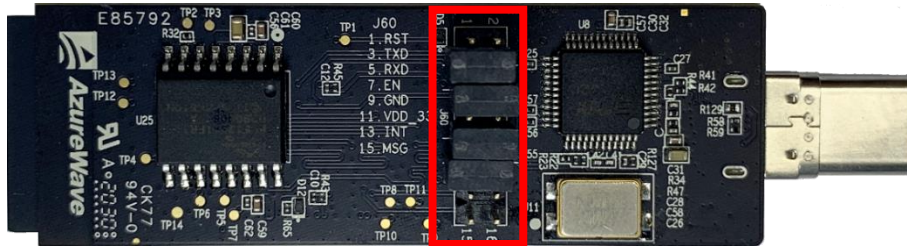
5. Additional Information

The AW-CU427-USB is designed for **Engineering Evaluation Purpose** Only as opposed to an end product. Thus, it may not comply with directives such as WEEE, CE and FCC. The dongle is not completely enclosed with a shielding case. User must take whatever measures to prevent ESD and minimize interference generated by the dongle. **For preventing any damage on this dongle, please plug it into USB female port horizontally.**

Appendix

AW-CU427-USB work with Arduino Uno

- Remove all the jumpers (2mm pitch) on the dongle before mating it with the Arduino Uno through the ARDUINO UNO ADAPTOR. **The digital logic level & power supply input of the dongle are 3.3V. DO NOT directly connect the dongle to the Arduino Uno.**



ARDUINO UNO ADAPTOR

- AW-CU427-USB connected to Arduino Uno through the ARDUINO UNO ADAPTOR

