HARDWARE USER GUIDE

(DOC No. HX6539-A-HWUG(WiFi-ESP12F)

HX6539-A(WiFi-ESP12F)

WE-I Plus

Preliminary version 01 August, 2021

Revision History

August,2021

Version	Date	Description of changes
01	2021/08/19	New setup.

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August,2021

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1. Introduction

The HX6539-A WiFi-ESP12F platform hardware kit enables rapid software development, code porting, software debugging, and profiling for HX6539-A applications. The hardware kit consists of an EVB hardware platform, including pre-installed EVB images of HX6539-A configurations with peripherals.

This document describes the HX6539-A hardware kit and procedures to run the applications on the platform.

2. HX6539-A WiFi ESP12F Platform

2.1. HX6539-A WiFi ESP12F Platform System Requirement

- WiFi ESP12F board
- Connection cable
  - Micro USB cable: I²C/SPI/Flash download
  - JTAG probe: ASHLING Opella-XD for ARC™ **(optional)**
- Software tools
  - mw_devkit_arc_Q_2019_12_win_install.exe **(MetaWare Toolset)**
  - HMX_FT4222H_GUI **(I²C/CLK/SPI/~~Flash Download~~)**
  - teraterm-4.76 **(UART terminal)**
  - OPXDARCv1.2.6.EXE **(ASHLING ICE Driver) (optional)**

2.2. HX6539-A WiFi ESP12F Hardware

- WiFi ESP12F Board Block Diagram

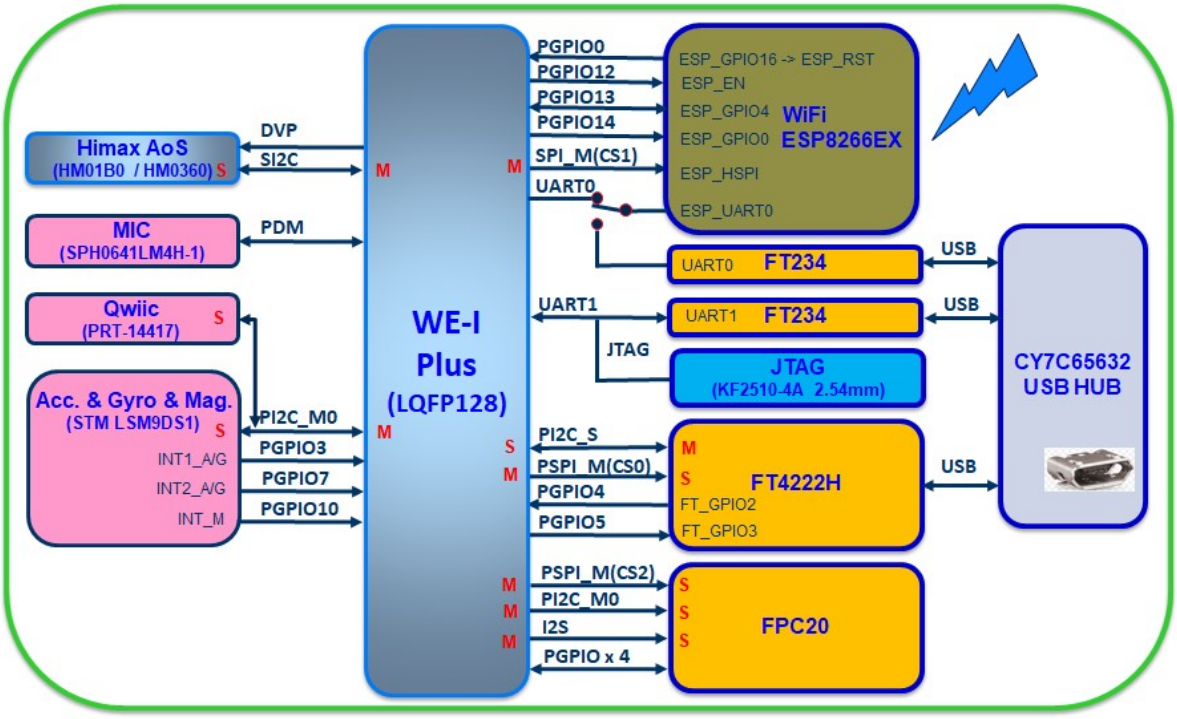

Figure 2.1: WiFi ESP12F Board Block Diagram

- PCB mechanical dimension, board size 40 x 40mm

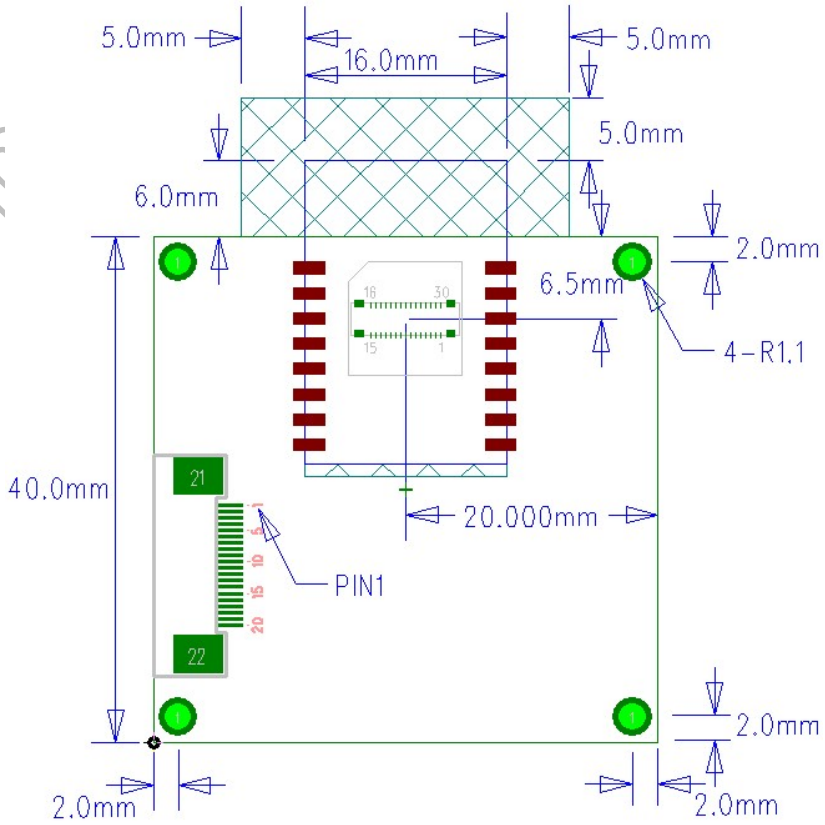

Figure 2.2: WiFi ESP12F Board PCB Dimension

- WiFi ESP12F Board Placement

  - Top View

  - Bottom View

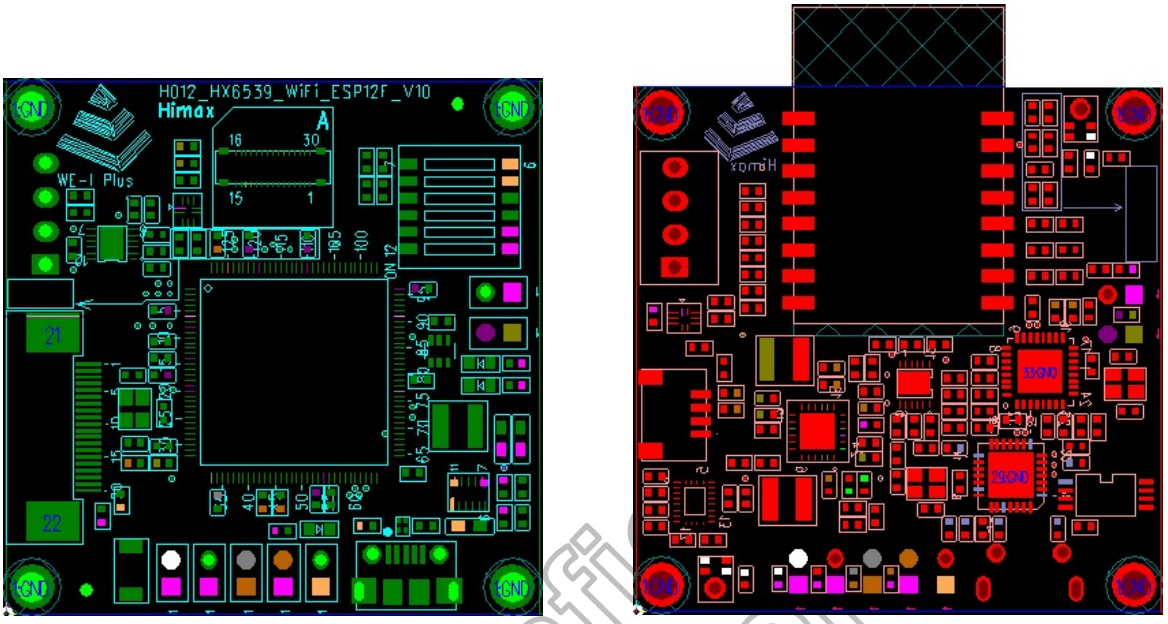

Figure 2.3: WiFi ESP12F Board Placement

- PCB stack-up

4-Layer: Signal **(L1)**, GND **(L2)**, VCC **(L3)**, Signal **(L4)**.

4L T=1.6mm						Differential Impedance W/S/W	Reference Layers
Stack-up	**Layer**	**Material**	**Type**	**Thickness**	**Unit**	**100Ω ± 10%**	
-	-	S/M	-	0.5	mils	-	-
-	L1	Cu	1/2oz+plating	1.2	mils	6/5/6 mil	L2
-	-	P.P	-	3	mils	-	-
-	L2	Cu	1oz	1.4	mils	-	-
1.3mm 1/1 (including)	-	Core	FR4	50	mils	-	-
-	L3	Cu	1oz	1.4	mils	-	-
-	-	P.P	-	3	mils	-	-
-	L4	Cu	1/2oz+plating	1.2	mils	6/5/6 mil	L3
-	-	S/M	-	0.5	mils	-	-
-	-	Thickness	-	62.2	mils	-	-
-	-	-	-	1.58	mm	-	-

Table 2.1: 4-Layer PCB Stack-up

- FPC20 **(CN2)** connector is used to external device with I2S, SPI master, I2C master interface, GPIOs, STROBE signals. VCC_IN is the USB 5V power supply from CN1 (Micro USB connector).

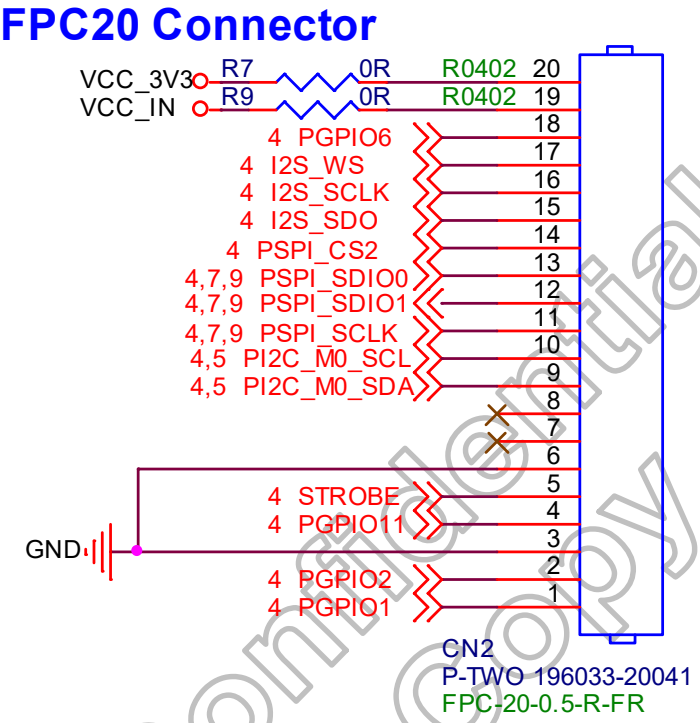

Figure 2.4: WiFi ESP12F Board FPC20 (CN2) Connector

- Qwiic **(CN3)** is used to link external I2C slave device.

Boards must be 3.3V. You may do an on-board buck or boost to get to a different voltage **(1.8V or 5V, for example)**, but the board must have onboard translation circuitry to work at 3.3V.

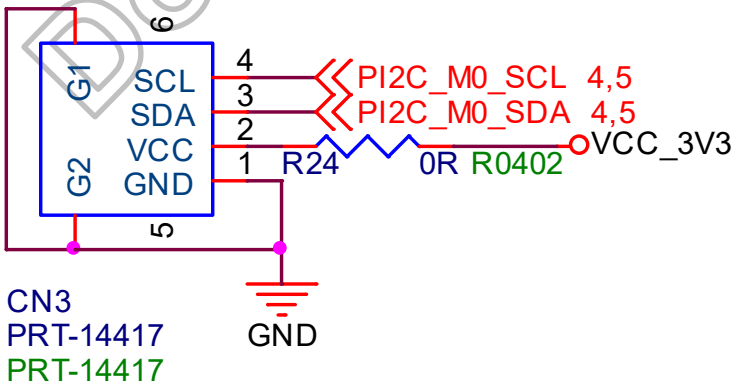

Figure 2.5: WiFi ESP12F Board Qwiic (CN3) Connector

- Main Component List

The main components on the WiFi ESP12F board are listed here.

Reference	Part No.	Description
AoS	HM0360	Himax/ 1/6" 640x480 VGA 60FPS CMOS Image Sensor.
	HM01B0	Himax/ 1/11" 320x320 QVGA 60FPS Ultra Low Power CMOS Image Sensor.
CN1	105017-0001	Molex/ Micro USB Type B Connector.
CN2	196033-20041	P-TWO/ FPC 20pin, 0.5pitch, 2.0H.
CN3	PRT-14417	SparkFun/ Qwiic JST Connector - SMD 4-Pin.
CN4	OK-10F030-04	OCN/ Board to board connector.
MIC1, MIC2	SPH0641LM4H-1	Knowles/ Digital microphones, PDM.
SW1	DSHP06TSGET	C&K/ 1.27mm 6 pins DIP switch SPST.
SW2	B3U-1000P	Omron/ Switch tactile SPST-NO 0.05A 12V.
U1	MP28164GD-Z	MPS/ 1.2~5.5V Buck-Boost Converter.
U2	ADP5134ACPZ-R7	ADI/ Dual 1.2A Buck + Dual 300mA LDO.
U3	HX6539_LQFP128	Himax/ WE-I plus LQFP128 package.
U4, U12	TS3A5223RSWR	TI/ IC 0.5ohm dual SPDT analog switch.
U5	LSM9DS1	STM/ 3D accelerometer, 3D gyroscope, 3D magnetometer.
U6	CY7C65632-28LTXC	Cypress/ USB HUB x 4ports
U7	M24C02-WDW6TP	ST/ 2k bit EEPROM
U8	FT4222HQ-D-R	FTDI/ USB to SPI, I2C bridge
U9, U10	FT234XD-R	FTDI/ USB to UART bridge
U11	ESP-12F	Espressif Systems/ WiFi Module (ESP8266-EX, WiFi 802.11 b/g/n)
X1	ECS-240-10-36-CKM-TR	ECS/ Crystal 24MHz 10ppm 10pF.
X2, X3	ECS-120-8-36-CGN-TR	ECS/ Crystal 12MHz 50ppm 8pF.

Table 2.2: WiFi ESP12F Board Main Component List

- GPIO Function

There are total 15 GPIOs on WE-I Plus IC.

GPIO No.	Direction	Name	Description
PGPIO0	In	ESP_RST	WiFi module reset state signal.
PGPIO1	In/Out	CN2.1	To CN2 FPC20 connector, GPIO pin.
PGPIO2	In/Out	CN2.2	To CN2 FPC20 connector, GPIO pin.
PGPIO3	In	INT1_A/G	Accelerometer and gyroscope interrupt 1 **(INT1_A/G)**.
PGPIO4	In/Out	FTDI_GPIO2	To FT4222H IC handshaking pin **(FTDI_GPIO2)**.
PGPIO5	In/Out	FTDI_GPIO3	To FT4222H IC handshaking pin **(FTDI_GPIO3)**.
PGPIO6	In/Out	CN2.18	To CN2 FPC20 connector, GPIO pin.
PGPIO7	In	INT2_A/G	Accelerometer and gyroscope interrupt 2 **(INT2_A/G)**.
PGPIO8	Out	LED_G	WE-I Plus status indication **(LED_GREEN)**.
PGPIO9	Out	LED_B	WE-I Plus status indication **(LED_BLUE)**.
PGPIO10	In	INT_M	Magnetic sensor interrupt **(INT_M)**.
PGPIO11	In/Out	CN2.4	To CN2 FPC20 connector, GPIO pin.
PGPIO12	Out	ESP_EN	WiFi module enable.
PGPIO13	Out	ESP_GPIO_4	WiFi module light sleep.
PGPIO14	Out	ESP_GPIO_0	WiFi module mode selection. ● WiFi module at UART download mode (PGPIO14 = 0). ● WiFi module at flash boot mode (PGPIO14 = 1).

Table 2.3: WiFi ESP12F Board GPIO Function

- Jumpers

There are seven jumpers available for measuring current consumption.

Jumper No.	Operation Voltage	Description
J1	1.8V ~5.5V	System power input to the Buck-Boost converter.
J2	3.3V	Including the following component. ● Dual 1.2A Buck + Dual 300mA LDO. ● WE-I Plus. ● AoS **(HM01B0 or HM0360)**.
J3	1.8V	WE-I Plus IC 1.8V power **(POR, ADC, CLDO, SLDO, PLL, SIF, FLASH)**.
J4	3.3V	WE-I Plus PIF IO power **(PIF_IOVDD)**.
J5	3.3V	Microphone MIC1 & MIC2 power supply.
J6	3.3V	Accelerometer & gyroscope & magnetometer power supply.
J7	3.3V	WiFi ESP12F power supply.

Table 2.4: WiFi ESP12F Board Jumper

- Jumper Position

The seven jumper positions are shown below.

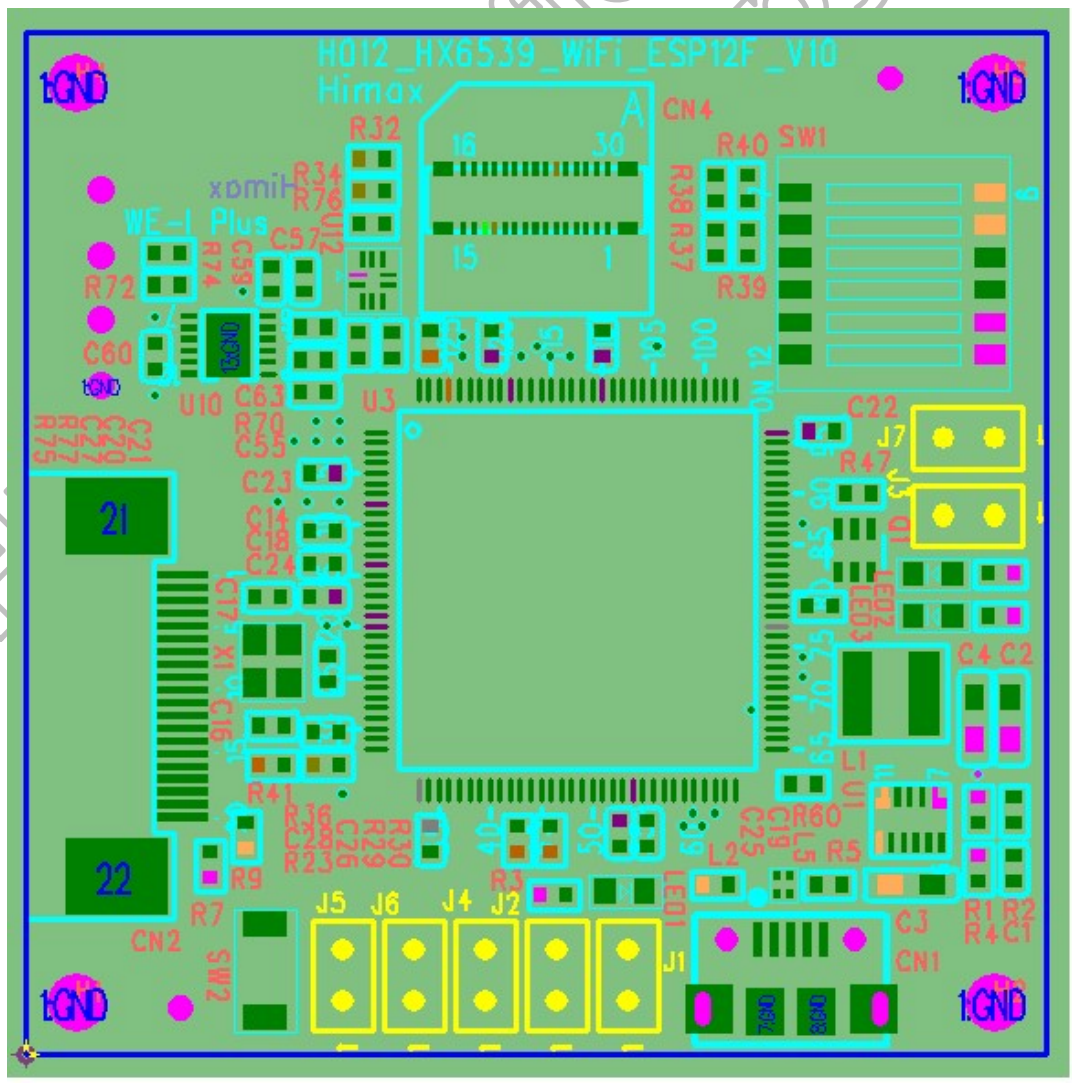

Figure 2.6: WiFi ESP12F Board Jumper Positions

- Dip Switch

There are five functions for the switch selector.

No.	Function	SW-OFF	SW-ON	Description
1	I2C Boot	Disable	Enable	Enable/Disable WE-I Plus boot mode.
2	WiFi UART	WE-I	FTDI	Connect WiFi UART to WE-I or FTDI IC.
3	WiFi Mode	Normal	UART Download	Enable/Disable WiFi UART download mode
4	ICE Mode	UART	JATG	Enable/Disable WE-I Plus JTAG(/ICE) mode.
5	FTDI	Power-OFF	Power-ON	Power-ON/OFF FTDI debug function mode.
6	FTDI	Power-OFF	Power-ON	Power-ON/OFF FTDI debug function mode.

Table 2.5: WiFi ESP12F Board DIP Switch

- Dip Switch Position

The DIP switch position is shown below.

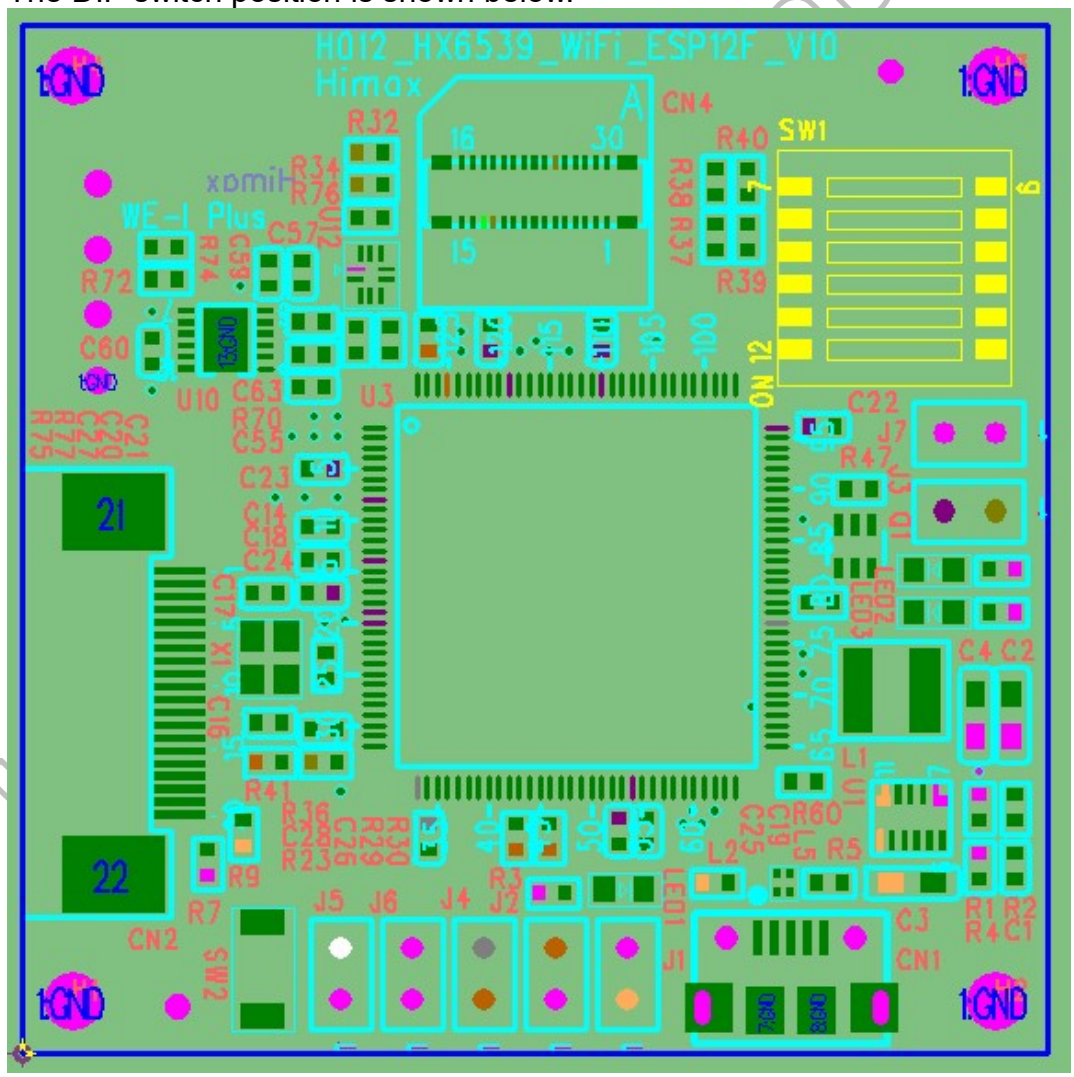

Figure 2.7: WiFi ESP12F Board DIP Switch Location

- WiFi ESP12F board LEDs function

  It's recommended that there is no need to mount LED1 since the sensitive power consumption. When the user wants to measure system power consumption, please de-solder R3 which is LED current limiting resistance. If the user wants the lowest power consumption, please program the firmware to turn off LED2 and LED3.

LED no.	Color	Description
LED1	Green	3.3V power supply indication LED.
LED2	Green	WE-I Plus status indication LED (PGPIO8).
LED3	Blue	WE-I Plus status indication LED (PGPIO9).

Table 2.6: WiFi ESP12F Board LEDs Function

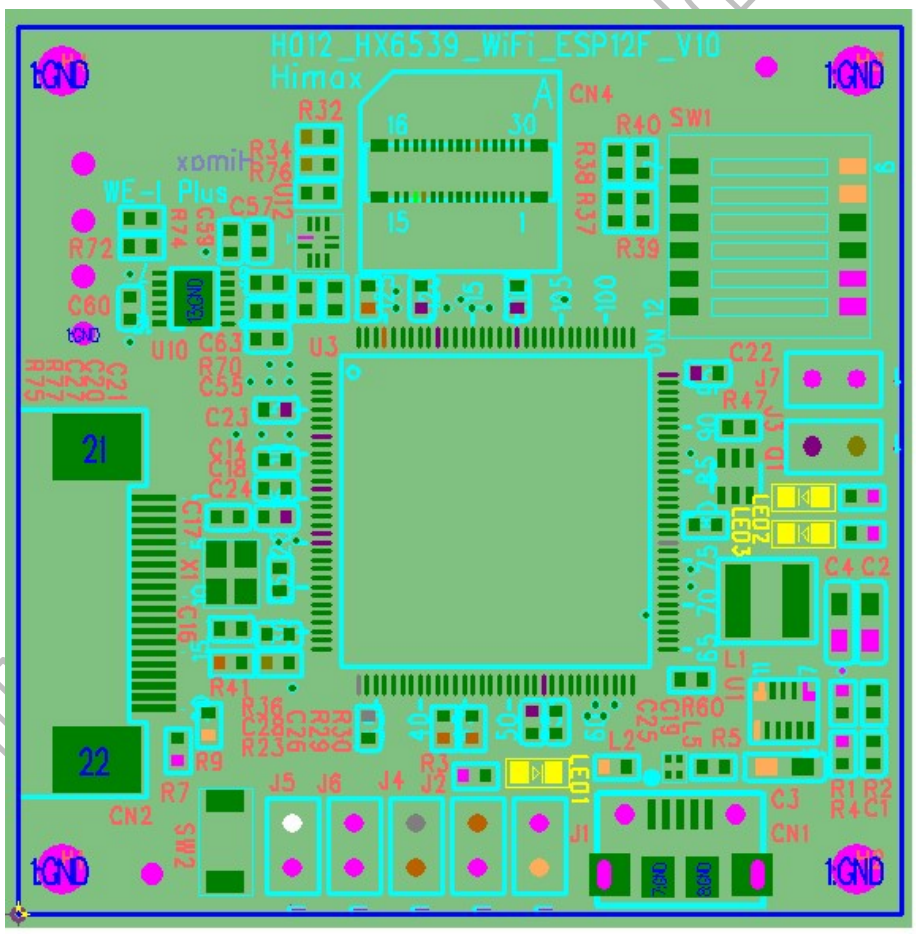

Figure 2.8: WiFi ESP12F Board LEDs Location

- PCB antenna display instruction
  No metal objects are allowed in the 5mm three-dimensional space

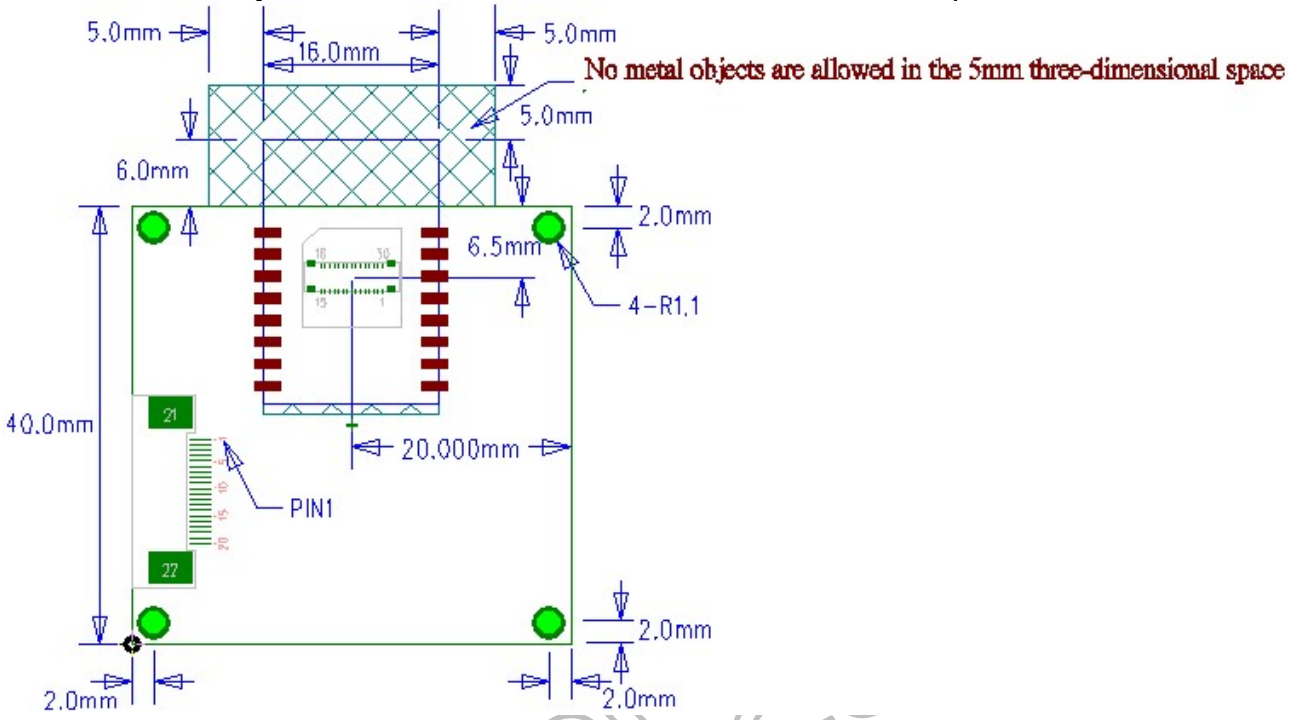

Figure 2.9: WiFi ESP12F Board PCB Antenna Display Instruction

- ASHLING Opella-XD for ARC™

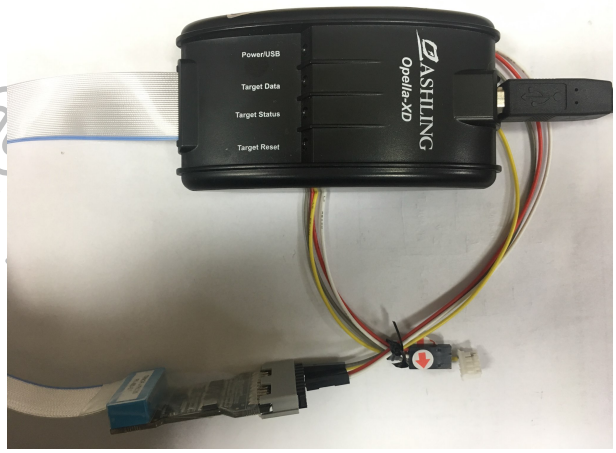

Figure 2.10: ASHLING Opella-XD

2.3. HX6539-A WiFi ESP12F Platform Setup

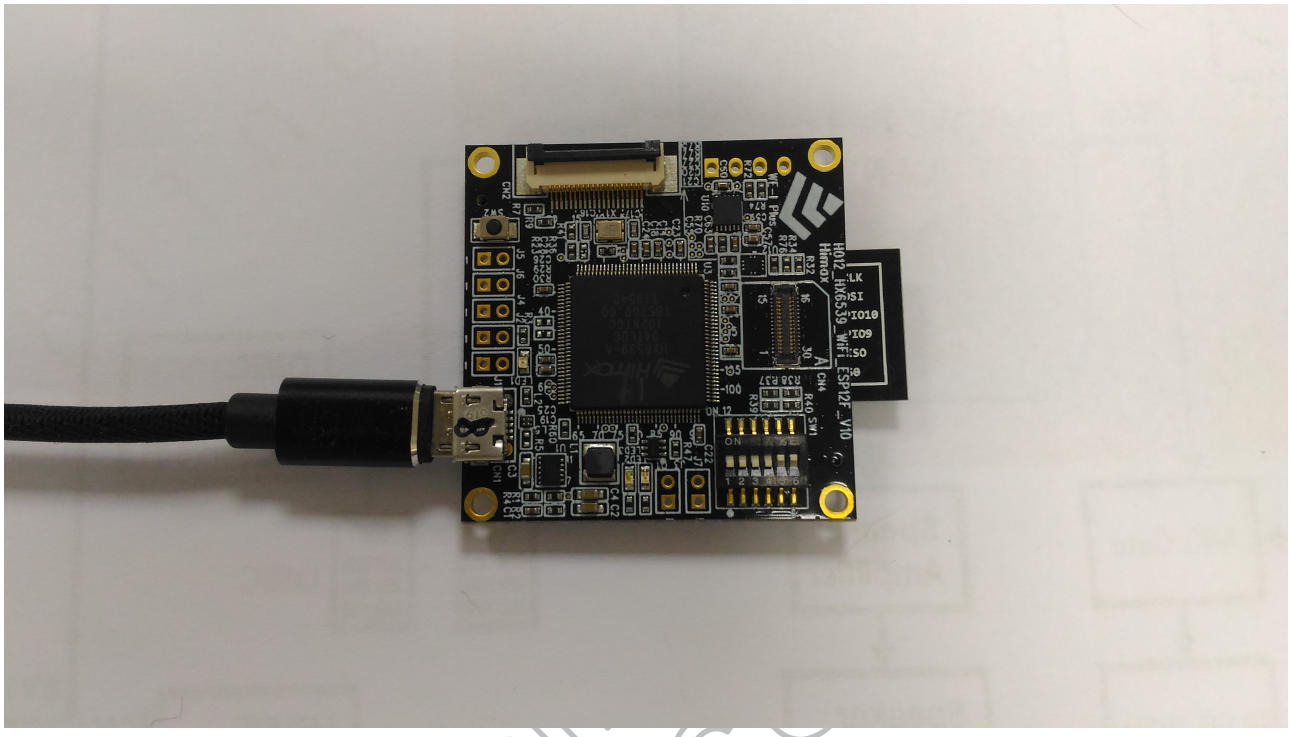

Figure 2.11: HX6539-A WiFi ESP12F Platform Setup

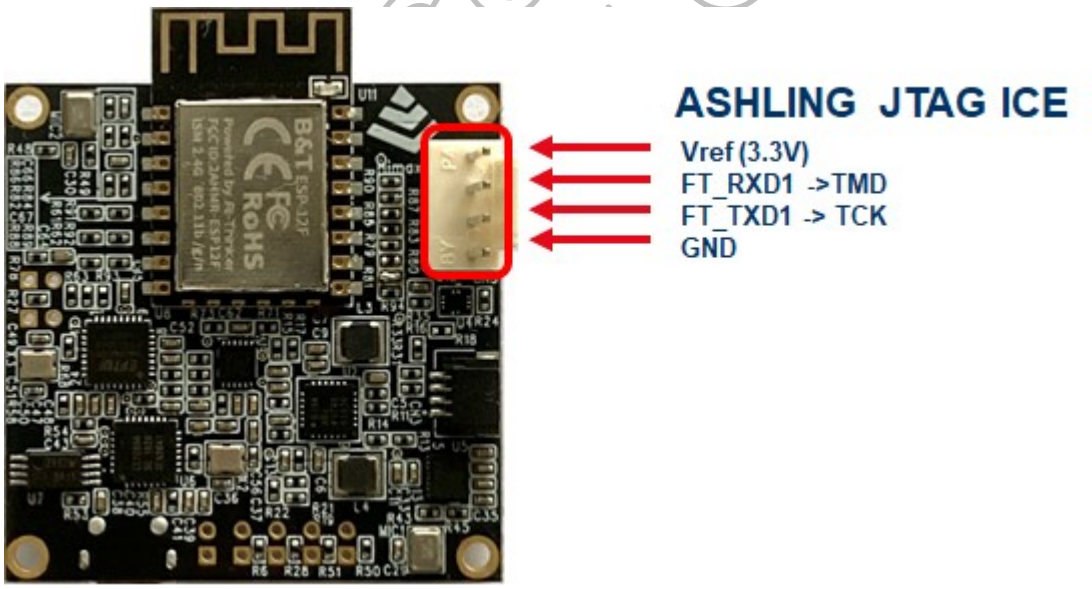

Figure 2.12: ASHLING JTAG ICE

2.4. HX6539-A WiFi ESP12F Platform Startup

Use the following procedure to startup the HX6539-A WiFi ESP12F platform.

A. Power on EVB
B. Flash image download
C. Reset WiFi ESP12F board
D. Check UART message output
E. Receive image from kit (FW support is required)

A. Power on EVB

The WiFi ESP12F board are connected to the PC through each USB cable.

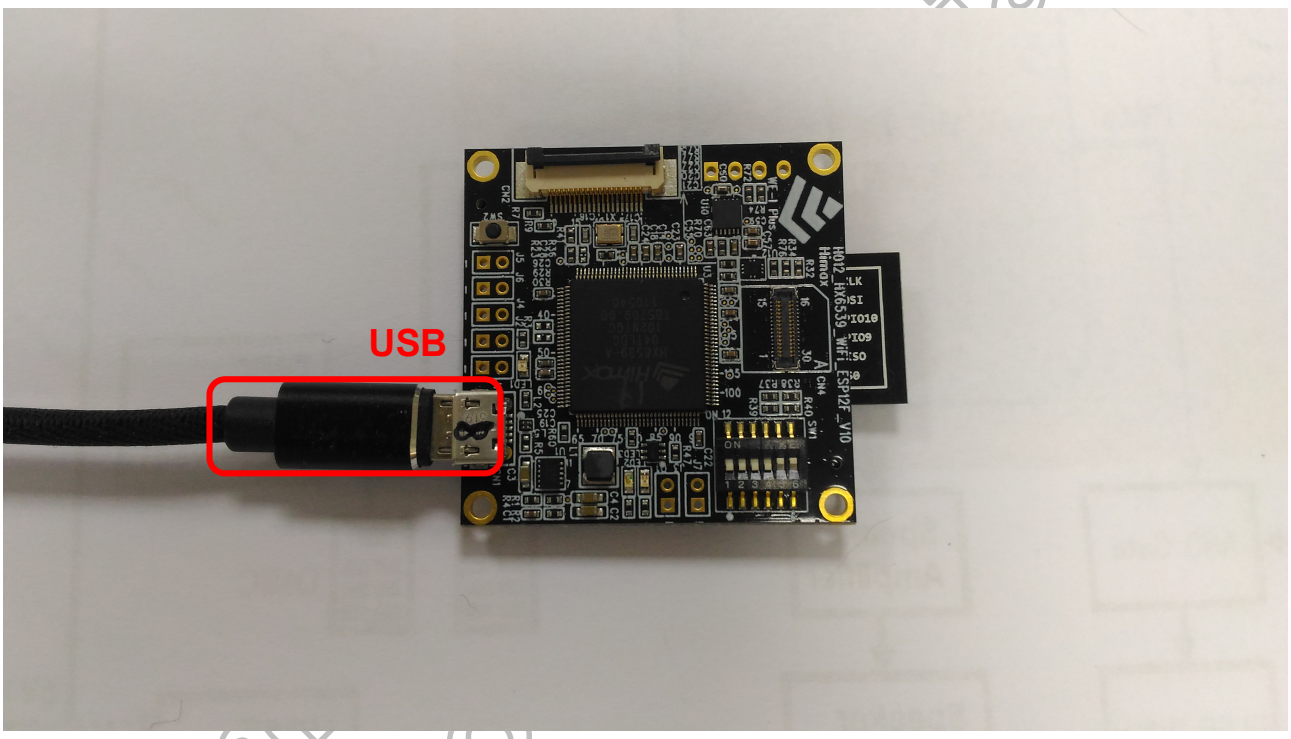

Figure 2.13: WiFi ESP12F Board Power up

B. Flash image download

a. Download Firmware use Metaware

WiFi ESP12F board SW1 pin1 switch to “OFF”

I²C Setting **(load PLL_Script_24to400MHz_JTAG Script)** before load elf.

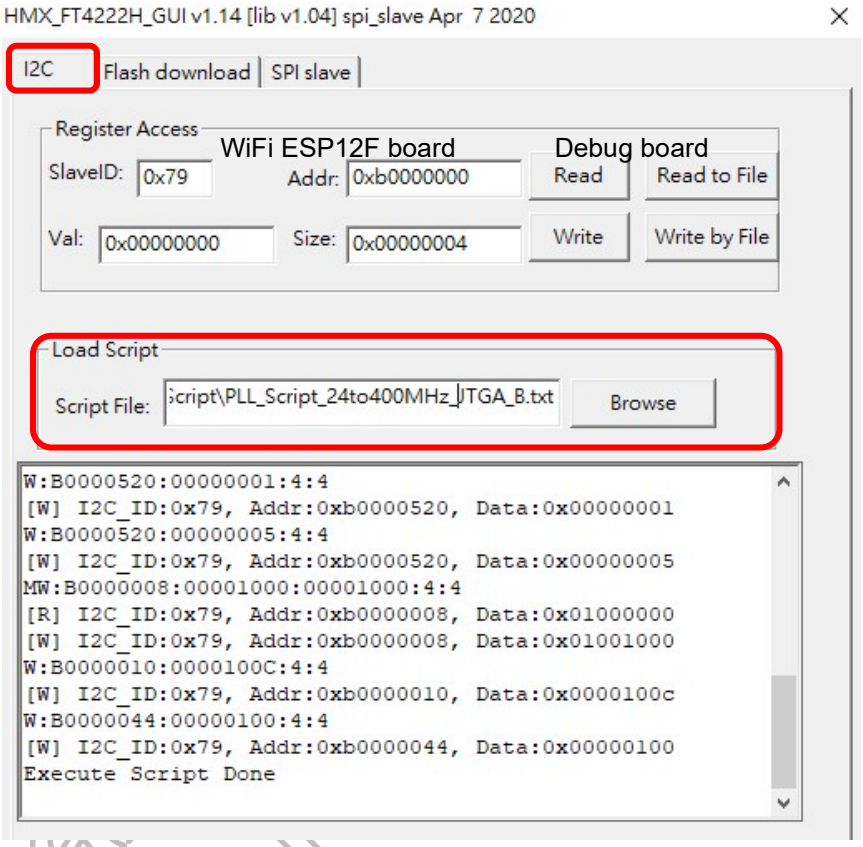

Figure 2.14: I2C Load Script File by GUI for Metaware Load elf File

- Open Metaware and Select **Run > Debug Configurations** and Select elf file that you want to download to HX6539-A.

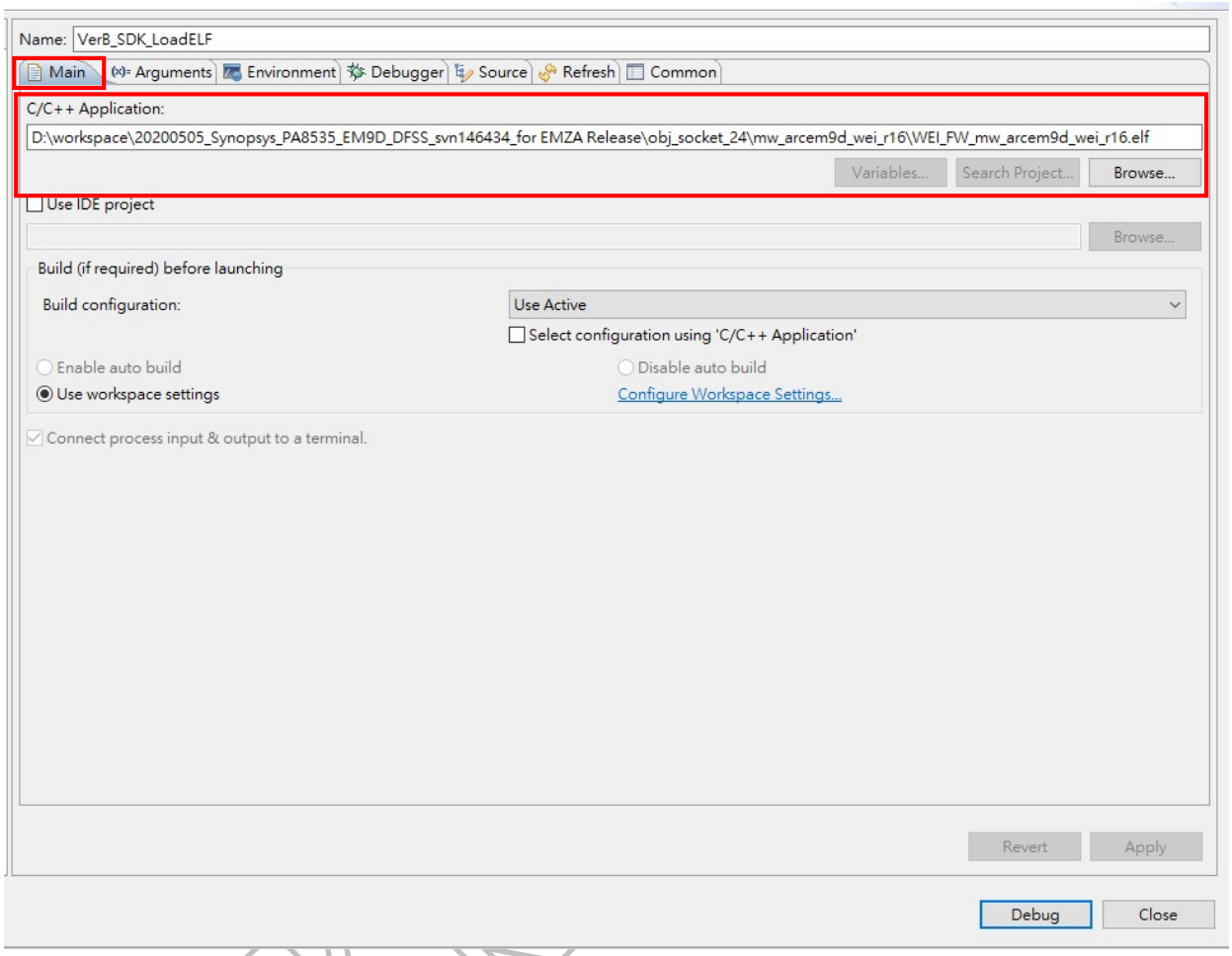

Figure 2.15: Metaware Debug Configuration I

- Set “Target Selection”

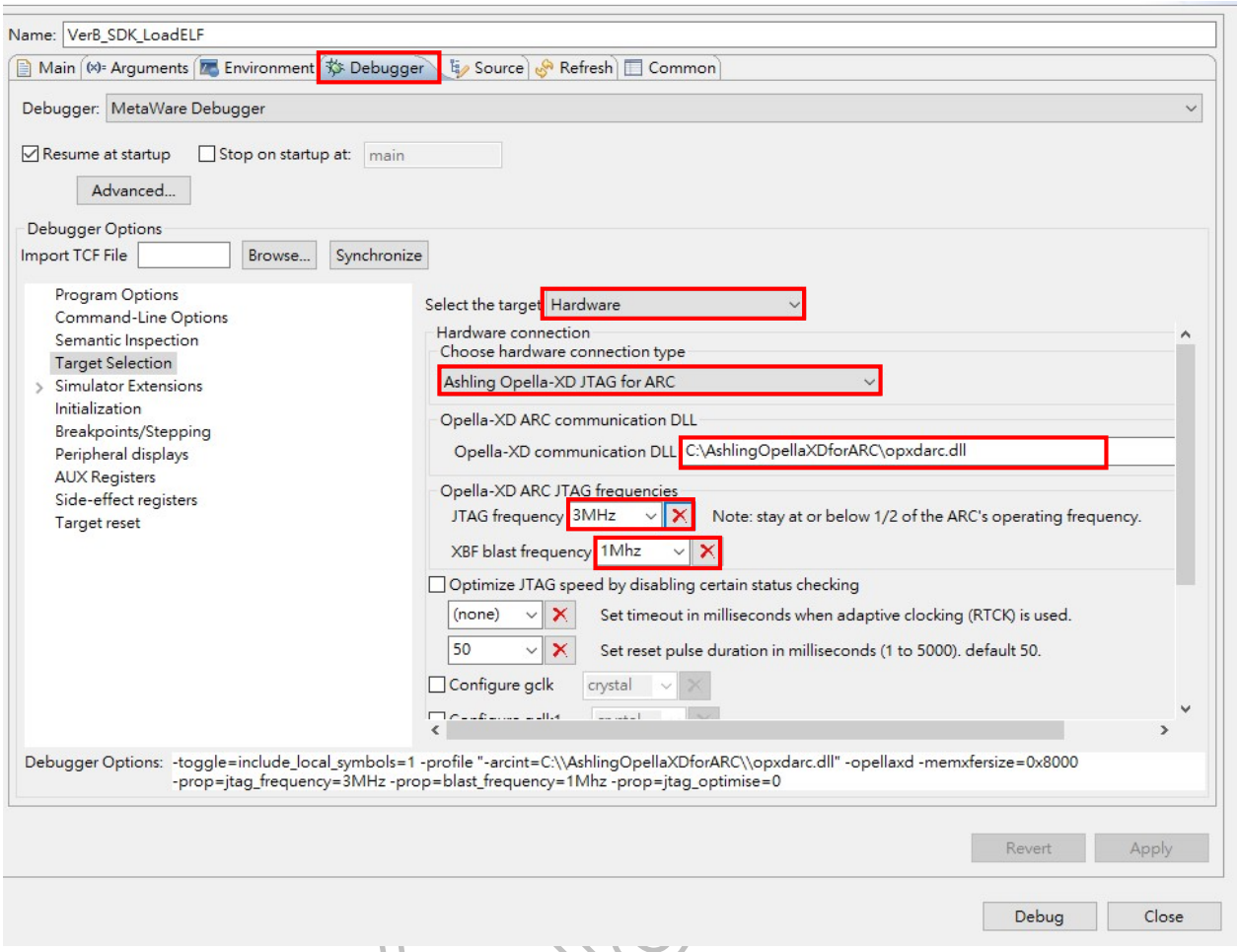

Figure 2.16: Metaware Debug Configuration II

- Start Debug

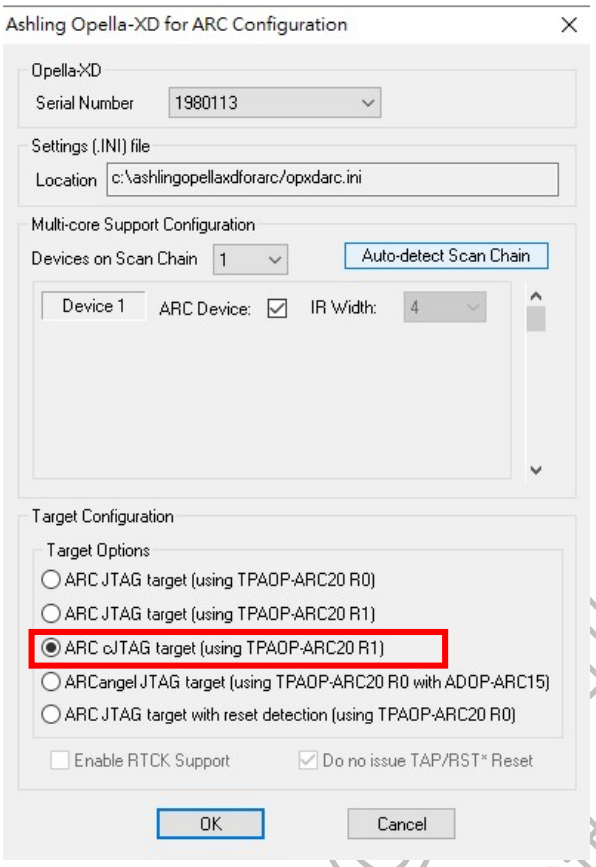

Figure 2.17: Metaware Debug Configuration III

- Debugger connected to Device, when the MetaWare Debugger connected to Device, UART will output message as the following **(Program still NOT run)**

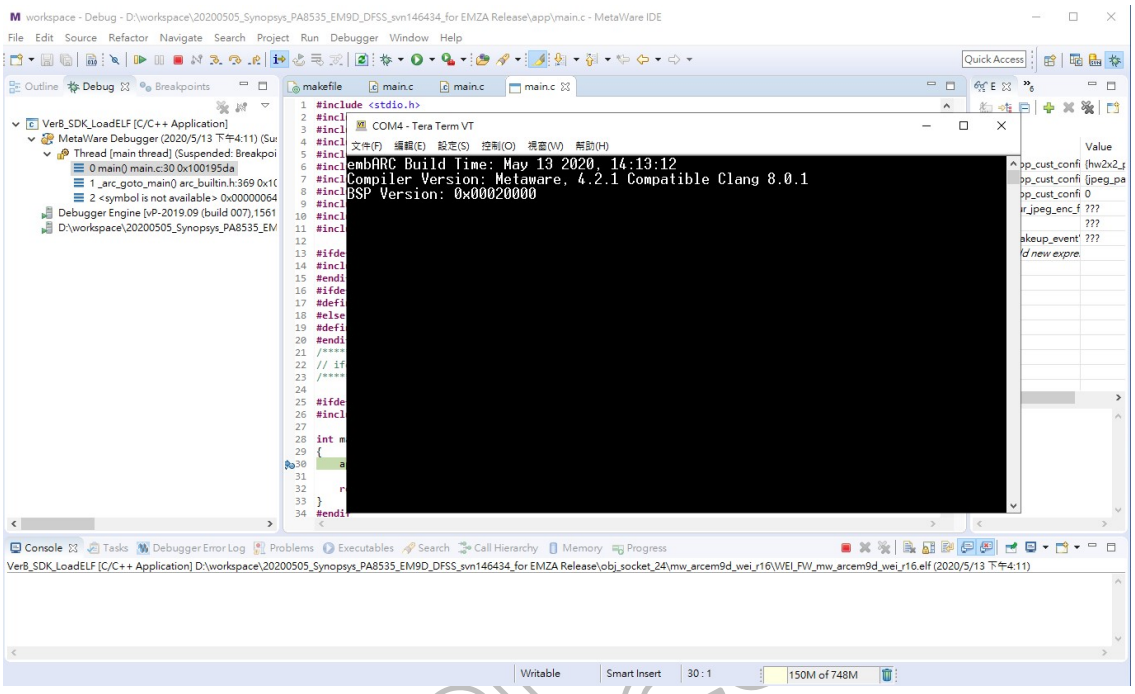

Figure 2.18: UART Output Message I

- When the MetaWare Debugger Start to "**run**" program, UART will output message as the following

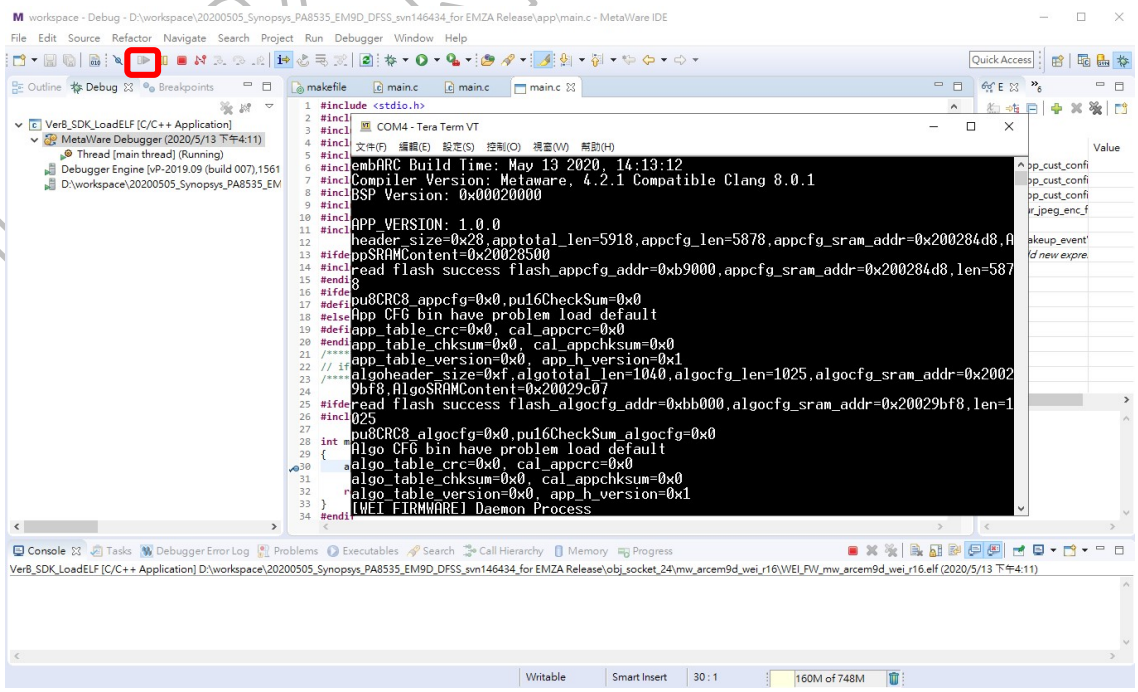

Figure 2.19: UART Output Message II

- Please note that the UART output log message needs load script **(JTAG switch_to UART1)** by GUI tool, because UART and JTAG is share pin.

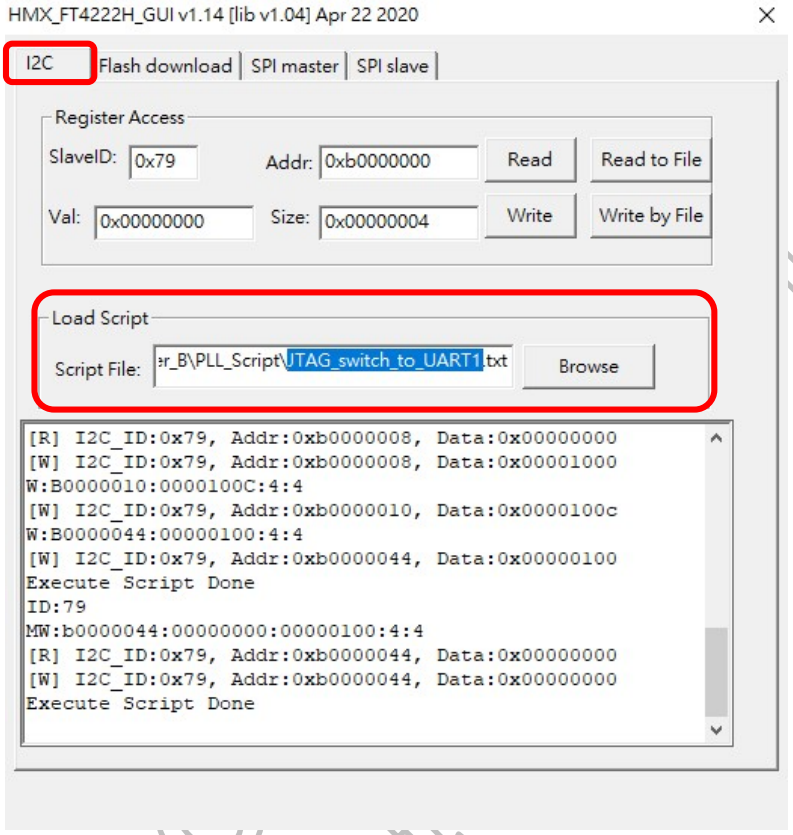

Figure 2.20: UART Output Message Load Script by GUI Tool

C. Reset WiFi ESP12F board

The user can press the Reset button **(SW2)** to reset WiFi ESP12F board and restart the application program. Please note that SW1 pin1 should be in the “OFF” position.

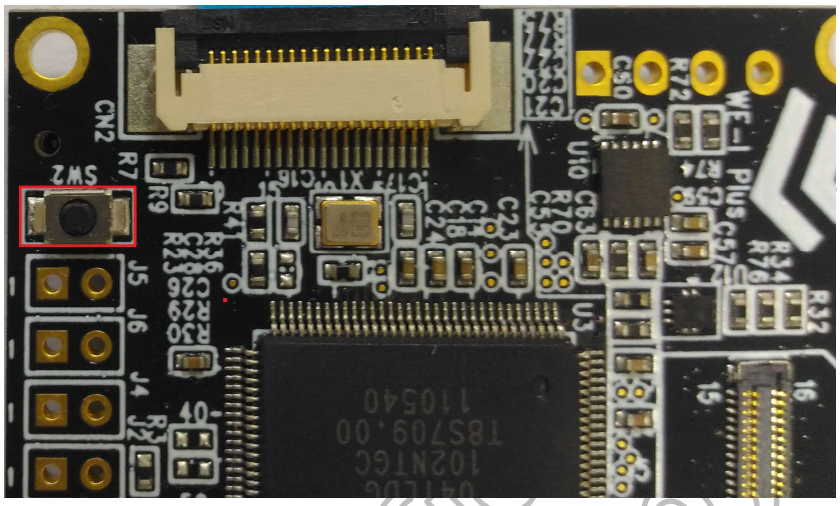

Figure 2.21: WiFi ESP12F Board Reset

D. Check UART message output

The system will output the following message to the UART console. Please setup UART terminal tool setting as **(115200/8/N/1)**.

(If the boot method is to load the ELF file into SRAM by JTAG, the SRAM data will be cleared after hardware reboot.)

E. Receive image from kit **(FW support is required)**

The HX6539-A provides master send image.

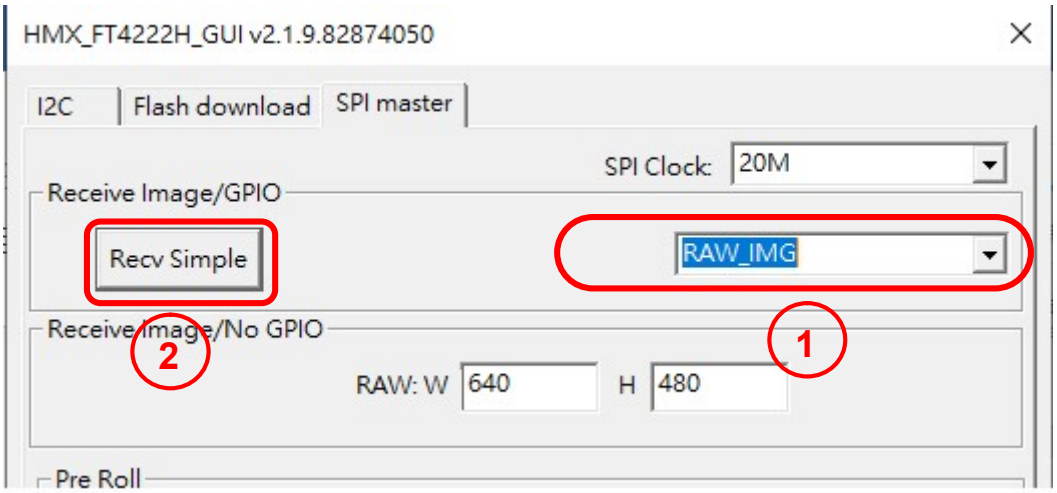

Figure 2.22: FT4222H Tool SPI Master

In SPI master tag
Step 1: Select RAW_IMG
Step 2: Click Receive button

Step 3: Shows the image window

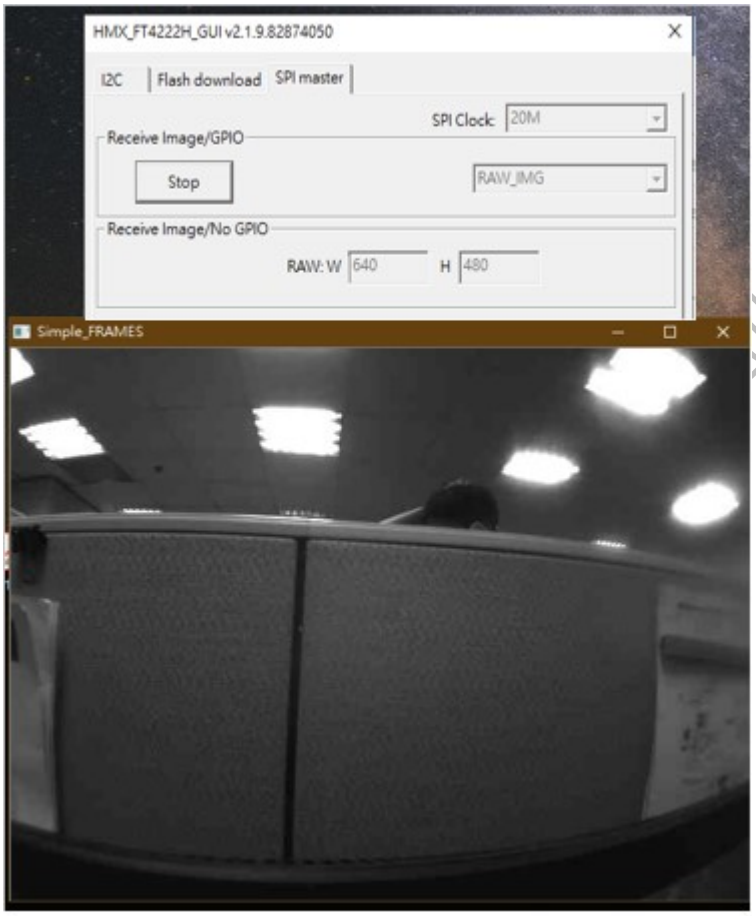

Figure 2.23: FT4222H tool SPI Master