AW-AM457-D-EVB

IEEE 802.11 1X1 a/b/g/n Wireless LAN and

Bluetooth 5.1

15mm x 15mm LGA module

<u>User Guide</u>

Rev. 01

(For Standard)

Revision History

Version	Revision Date	Description	Initials	Approved
01	2021/09/12	• Initial Version	Roger Liu	N.C. Chen

1. System Setup

1-1. Hardware Requirements

- AW-AM457-D-EVB (EVB for AW-AM457-D)
- Host system need running the Linux operating system (Ubunbu14.04 or later)
- Windows system (OS later than Windows XP) for Labtool.
- Vector Signal Analyzer/WLAN analyzer for transmit measurements.
- WLAN signal generator for receiver measurements.
- RF isolation chamber for receive measurements.
- RF attenuators
- RF cable
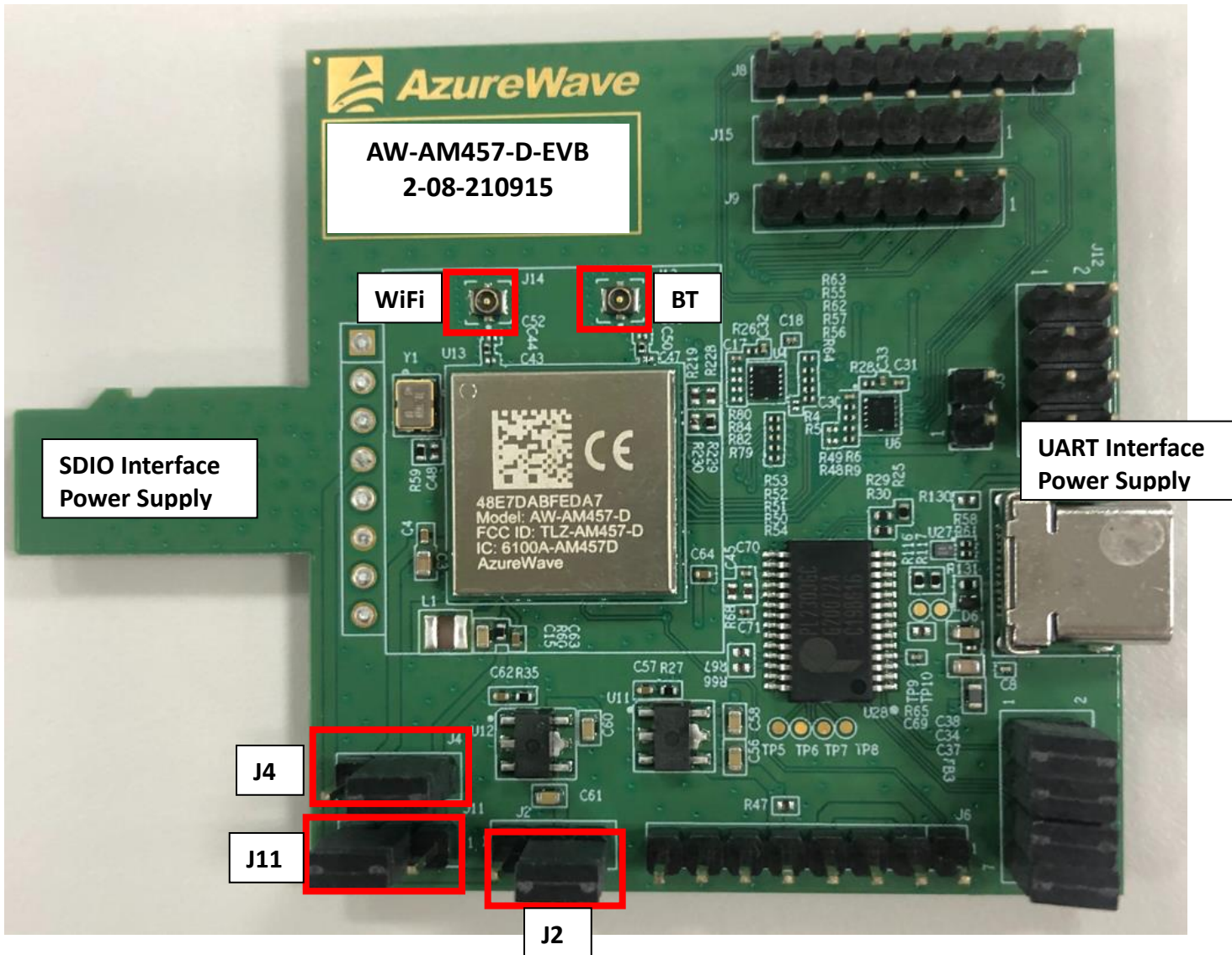
1.1.1 For SDIO supply

For SDIO supply VBAT, please connect J2(1-2).
For SDIO supply VDDIO(1.8V), please connect J4(1-2).
For SDIO supply VDDIO(3.3V), please connect J4(2-3).
For SDIO supply VIO_SD(1.8V), please connect J11(1-2).
For SDIO supply VIO_SD (3.3V), please connect J11(2-3).

1.1.2 For USB supply

For USB supply VBAT, please connect J2(2-3).
For USB supply VDDIO(1.8V), please connect J4(1-2).
For USB supply VDDIO(3.3V), please connect J4(2-3).
For USB supply VIO_SD(1.8V), please connect J11(1-2).
For USB supply VIO_SD (3.3V), please connect J11(2-3).

1-2. Software package requirement
SDIO-UART

"SDIO-UART SW package_p171.zip"

1-2-1.Linux PC set up (SDIO-UART)
After download the SW package from Azurewave contact window, please build the driver first.

Open the folder and you can see below contents.

📁 Drivers

📁 MFG-W8978-MF-WIFI-BT-BRG-FC-VS2013-1.0.0.11-16.80.10.p171

Go into Driver folder and unzip the tar file you can see the files below.

📁 FwImage

🌐 SD-BT-8978-U16-MMC-16.26.10.p101-C4X14114_V0-GPL-src

🌐 SD-BT-CHAR-8978-U16-MMC-16.26.10.p101-C4X14114_V0-GPL-src

🌐 SD-UAPSTA-8978-U16-MMC-W16.68.10.p101-C4X16679_V0-app-src

🌐 SD-UAPSTA-8978-U16-MMC-W16.68.10.p101-C4X16679_V0-MGPL-src

🌐 SD-UAPSTA-8978-U16-MMC-W16.68.10.p101-C4X16679_V0-mlan-src

🌐 UART-BT-8978-U16-X86-16.26.10.p101-2.2-M4X14100-GPL-src

Unzip them all and go into the / *SD-UAPSTA-8978-U16-MMC-W16.68.10.p101-C4X16679_V0-mlan-src*
folder and use the cmds as below.

Make clean
Make build

Then and go into the
/ *SD-BT-8978-U16-MMC-16.26.10.p101-C4X14114_V0-GPL-src*
folder and use the cmds as below.

Make clean
Make build

1-2-2 Driver for UART-to-USB bridge IC(PL2303GC)

Update pl2303.ko driver to below direction and replace the original one.

*you can contact with Azurewave FAE for pl2303.ko file.
**notice: the kernel version may be different from the sample picture

```
root@azw-B85M-D3H:/lib/modules/3.19.0-25-generic/kernel/drivers/usb/serial# ls
aircable.ko         io_ti.ko          mxuport.ko      ssu100.ko
ark3116.ko          ipaq.ko           navman.ko       symbolserial.ko
belkin_sa.ko        ipw.ko            omninet.ko      ti_usb_3410_5052.ko
ch341.ko            ir-usb.ko         opticon.ko      usb_debug.ko
cp210x.ko           iuu_phoenix.ko    option.ko       usbserial.ko
cyberjack.ko        keyspan.ko        oti6858.ko      usb-serial-simple.ko
cypress_m8.ko       keyspan_pda.ko    pl2303.ko       usb_wwan.ko
digi_acceleport.ko  kl5kusb105.ko     qcaux.ko        visor.ko
empeg.ko            kobil_sct.ko      qcserial.ko     whiteheat.ko
f81232.ko           mct_u232.ko       quatech2.ko     wishbone-serial.ko
ftdi_sio.ko         metro-usb.ko      safe_serial.ko  xsens_mt.ko
garmin_gps.ko       mos7720.ko        sierra.ko
io_edgeport.ko      mos7840.ko        spcp8x5.ko
```

Input below cmds by terminal before connecting to AW-CM276NF-EVB's UART-to-USB port.

Insmod usbserial.ko
Insmod pl2303.ko

Connect USB-to-UART type C port to your PC and input "dmesg" to check if device ttyUSBx is generated successfully.

1-3.   Environment set up and Bridge Mode Tool

(1) The "Manufacturing Bridge" refers to the application that allows a user to send commands between Target platform and Windows 7 platform. The environment enables the user to test performance of the AW-AM457.
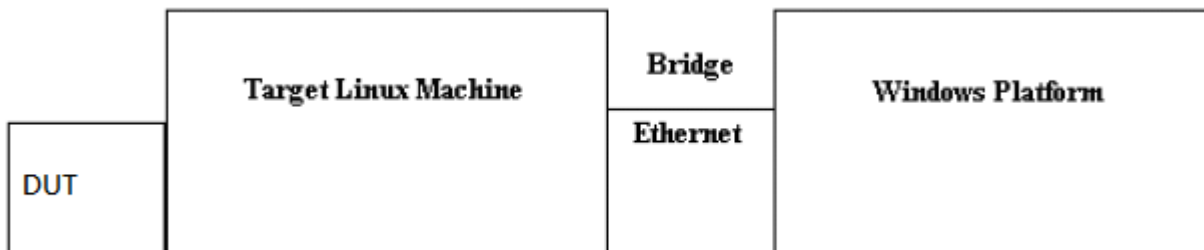
Manufacturing Bridge mode

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1-4. Start driver installation and DUT testing

1-4-1. Linux PC side
After building the driver at Linux PC, you can run the following commands to install the driver and firmware and start the Manufacturing bridge application with the following commands.

Please copy firmware in the SW package

\ MFG-W8978-MF-WIFI-BT-BRG-FC-VS2013-1.0.0.11-16.80.10.p132\FwImage

    📄 sdio8978_sdio_combo.bin
    📄 sdio8978_uart_combo.bin
    📄 usb8978_usb_combo.bin

To Linux system firmware direction

/lib/firmware/mrvl/

On the working direction, use the following commands to put the 88W8978 in MFG mode after power on DUT.

SDIO-UART:

a. For WiFi

Go into bin_sd8978 folder and key in below cmds

modprobe cfg80211
Insmod mlan.ko
Insmod sd8978.ko mfg_mode=1 cal_data_cfg=none fw_name=mrvl/sdio8978_uart_combo.bin

b. For BT

Hciattach /dev/ttyUSB0 any 3000000 flow

*Please notice and key in the correct ttyUSB number in your Linux PC system.
Bring up the ethernet interface and specify an IP address to the Target platform. This address must match the IP for the DUT in which the Host PC is expecting.
Ex. *ifconfig eth0 192.168.1.10 up*

The next line will start the MFG Bridge application.
>*./mfgbridge*

At this point, the target is ready to receive Labtool commands.

1-4-2. Windows PC side

On the Windows laptop where the Labtool release was downloaded, go to the folder shown below:

AddCal.dll	2020/12/19 上午 01:51	應用程式擴充	1,131 KB	
AddCalDLL.dll	2020/12/19 上午 01:51	應用程式擴充	1,131 KB	
AddCalDLL.lib	2020/12/19 上午 01:51	LIB 檔案	2 KB	
DutApi89XXDll.h	2020/12/19 上午 01:51	H 檔案	19 KB	
DutApiMimoBtDll.dll	2020/12/19 上午 01:51	應用程式擴充	442 KB	
DutApiMimoBtDll.lib	2020/12/19 上午 01:51	LIB 檔案	108 KB	
DutApiMimoBtDllDuallf.dll	2020/12/19 上午 01:52	應用程式擴充	463 KB	
DutApiMimoBtDllDuallf.lib	2020/12/19 上午 01:52	LIB 檔案	110 KB	
DutApiMimoBtDllUart.dll	2020/12/19 上午 01:52	應用程式擴充	605 KB	
DutApiMimoBtDllUart.lib	2020/12/19 上午 01:52	LIB 檔案	110 KB	
DutApiSisoBt	2020/12/19 上午 01:52	應用程式	376 KB	
DutBtApi.hc	2020/12/19 上午 01:51	HC 檔案	7 KB	
DutBtApi89XXDll.h	2020/12/19 上午 01:51	H 檔案	21 KB	
DutWlanApi.hc	2020/12/19 上午 01:51	HC 檔案	19 KB	
DutWlanApi89XXDll.h	2020/12/19 上午 01:51	H 檔案	33 KB	
Flash_SPI_header.bin	2020/12/19 上午 01:51	BIN 檔案	4 KB	
Flash_SPI_header.sbin	2020/12/19 上午 01:51	SBIN 檔案	4 KB	
GenHeader.bin	2020/12/19 上午 01:51	BIN 檔案	1 KB	
SetUp	2020/12/19 上午 01:51	組態設定	3 KB	
UsbHeader.bin	2020/12/19 上午 01:51	BIN 檔案	1 KB	

Edit the "SetUp.ini" file as shown in the lines highlighted in RED below. The setup DutIpAddress will be the IP address of your target.

HostIPAddress will be the IP address of the Windows XP Laptop.

```
[DutIp]
DutIpAddress = 192.168.1.10
HostIpAddress = 192.168.1.100
Protocol = TCP
```

Then you can double click "DutApiSisoBt.exe" to enter labtool as below picture.

(2) bin Folder Contents
Download the latest MFG release from the NXP website and unzip it.

2. RF Basic Test

2.1 Initial Command
As the information showed on your screen, please enter these commands below to start your test.

Command: 1 Wi-Fi testing
Command: 2 BT testing

```
Name:           Dut labtool
Version:        1.0.0.82
Date:           Mar 29 2016 (15:55:01)

Note:

1. =========WiFi tool=============
2. =========BT   tool=============

Enter CMD 99 to Exit

Enter option:
```

2.2 Generate 802.11a/b/g/n Packet commands
a. Tx on CH 6 at 10 dBm with a CCK-11Mbps data rate in 20 MHz BW mode on WiFi

```
25                  // Stop Tx
30 0                // Set to 2.4 GHz Band
112 0               // Set to 20 MHz BW
12 6                // Set to CH 6
22 6 10 0           // Set to CH 6 at 10 dBm Output Power with CCK/BPSK Data Rate on WiFi
25 1 4              // Tx at 11 Mbps
```
----
b. Tx on CH 100 at 8 dBm with a OFDM 54M Data rate in 20 MHz BW Mode on WiFi

```
25                  // Stop Tx
30 1                // Set to 5 GHz Band
112 0               // Set to 20 MHz BW
12 100              // Set to CH 100
22 100 8 1          // Set to CH 100 at 8 dBm Output Power with OFDM Data Rate on WiFi
25 1 13             // Tx at 54 Mbps
```
----

c. Tx on CH 102 at 12 dBm with a MCS7 Data rate in 40 MHz BW Mode on WiFi

```
25                  // Stop Tx
30 1                // Set to 5 GHz Band
112 1               // Set to 40 MHz BW
12 100              // Set to CH 102
22 100 12 2         // Set to CH 102 at 12 dBm Output Power with MCS Data Rate on WiFi
25 1 22             // Tx at MCS 7
```

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Data rate set up

B mode & G mode:

1Mbps	5.5Mbps	11Mbps	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps
1	3	4	6	7	8	9	10

36Mbps	48Mbps	54Mbps
11	12	13

N mode:

MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
15	16	17	18	19	20	21	22	

After you type above command, you can measure the 802.11b/g/n packet by your RF test instrument (exp: Agilent 4010, IQview…).

2.3 Generate 802.11 a/b/g/n continuous symbol Commands

a. Cont. Tx on CH 36 at 8 dBm with a MCS7 Data rate in 20 MHz BW Mode on WiFi

```
35                      // Stop Tx
30 1                    // Set to 5 GHz Band
112 0                   // Set to 20 MHz BW
12 36                   // Set to CH 36
22 36 8 2               // Set to CH 36 at 8 dBm Output Power with MCS Data Rate on WiFi
35 1 22                 // Tx at MCS 7
```

2.4 Test RX sensitivity Commands

a. Rx on CH 102 in 40 MHz BW Mode on WiFi

```
35                       // Stop Tx
30 1                     // Set to 5 GHz Band
112 1                    // Set to 40 MHz BW
12 100                   // Set to CH 102
31                       // Clear all the received packets
32                       // Get Rx Packet Count and then clear the Rx packet counter
```

2.5 Others Commands

(1) **Command 45**→ Check the MAC
(2) **Command 99**→ Quit the test mode/ Quit the MFG tool

2.6 BT test mode Commands

This is how we test our BT: let BT enter test mode, then connect to tester for testing.
(1) Command 45→Check BT MAC.
(2) Command 78 1→BT enter test mode.

After you type above command, you can measure BT signal both TX/RX and the other BT test items by your BT instrument.

3. AW-AM457 EVB Attachment

J13
W.FL connector
ANT-NGFF-IPEX-2X2

0R C50

C47 NC
C51 NC

VIO

Y1
OSC

RTC_CLK 0R R59 32KHz
C48 R0402-m
NL
C0402-m

VIO

2 RF_CNTL0_N 51k NL 0402 R230
R229
51k 0402 VIO

2 RF_CNTL2_N 51k NL 0402 R219
51k NL 0402 R228

J14
W.FL connector
ANT-NGFF-IPEX-2X2
C44 0R
CC52 NC
C43 NC

U13

J12
(1) TMS 2 1 DNC45 2
(1) TCK 4 3 DNC44 2
(1) TDI 6 5 DNC43 2
(1) TDO 8 7 GPIO12
HEADER 4X2

GND76 GND75 GND74 GND73 GND72 RF_WIFI GND70 GND69
NC68 NC67 NC66 NC65 NC64 NC63 NC62 NC61 NC60 NC59 GND58 GND57 RF_BT GND55

1 NC1
2 NC2
3 DNC45 4 WCI_SOUT
2 DNC44 5 WCI_SIN
2 DNC43   NCS
Clock 6 GND6
RTC_CLK 7 SLP_CLK_IN
8 GND8
9 GPIO[1]/WiFi to Host Wake
3 PCM_OUT 10 GPIO[4]/PCM_DOUT
3 PCM_IN 11 GPIO[5]/PCM_DIN
3 PCM_CLK 12 GPIO[6]/PCM_CLK
3.3V 3 PCM_SYNC 13 GPIO[7]/PCM_SYNC
14 GND15
15 3V3_IN_1
16 3V3_IN_2
17 GND17
18 1V1(reserved)

C3 10uF C4 0.1uF

15X15_LGA_0

CON[1] 54 RF_CNTL2_N 2
CON[0] 53 RF_CNTL0_N 2
GPIO13 52 GPIO13 2
GPIO[0] 51 GPIO0 2
GPIO[12]/Host to BT Wake 50 GPIO12 2
GPIO[15]/JTAG_TMS 49 TMS (1)
GPIO[14]/JTAG_TCK 48 TCK (1)
GPIO[2]/JTAG_TDI 47 TDI (1)
GPIO[3]/JTAG_TDO 46 TDO (1)
UART_CTS_N 45 UART_CTS 2
UART_RTS_N 44 UART_RTS 2
UART_TX 43 UART_TXD 2
UART_RX 42 UART_RXD 2
GND41 41
USB_D- 40
USB_D+ 39
GND38 38
VIO_SD 37 VIO_SD_1

VIO_SD
C0402-m 0.1uF C64

1.8V
R60 0R
R0402-m
C15
4.7uF
C0503-M

L1 NC_2.2uH
L2520-M

VIO

C0402-m 0.1uF C53

1V8_DCDC_Lx(reserved) NC21 1V8_IN VIO GND23 GND24 NC25 NC26 NC27 NC28 PDn SDIO_DATA_CMD GND31 SDIO_DATA_CLK SDIO_DATA[0] SDIO_DATA[1] SDIO_DATA[2] SDIO_DATA[3]

SDIO_DATA[3] 2
SDIO_DATA[2] 2
SDIO_DATA[1] 2
SDIO_DATA[0] 2
SDIO_CLK 2
SDIO_CMD 2

WL_REG_ON (1)

R0201-M
(1) HOST_WL_WAKE R79 0R NC R78
3 WL_HOST_WAKE 0R NC
R0201-M
3 BT_HOST_WAKE R84 0R NC GPIO13
R0201-M
(1) HOST_BT_WAKE R80 0R NC GPIO0

Arduino Shield

USB_D+ & USB_D- : differential pair 90ohm TL;

J47:
1.GP2
2.GP3

Z diff = 90 ohms

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