

**Model Name : MWF220HDB**

**PCBA: MWF220HDB REV: A**

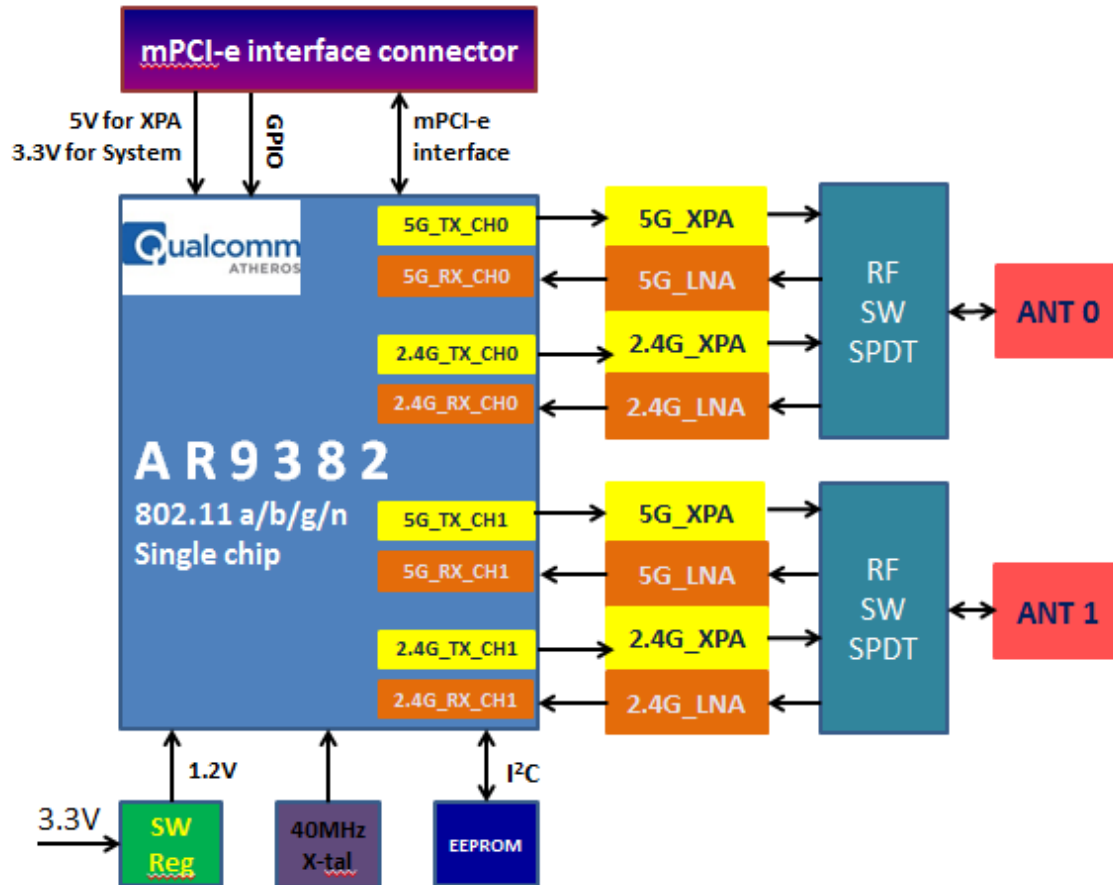
**2020/02/25**

## 1. Product Feature

MWF220HDB is a specific design for the Dual band Wi-Fi CPE product which needs a mini PCIe form factor module to fit into the reserved mini PCIe slots. MWF220HDB offers excellent RF performance and dual band ( 5GHz/ 2.4GHz ) function so that high throughput rate and large coverage range is easy to fulfill in the Wi-Fi CPE systems. Here is the main feature of MWF220HB:

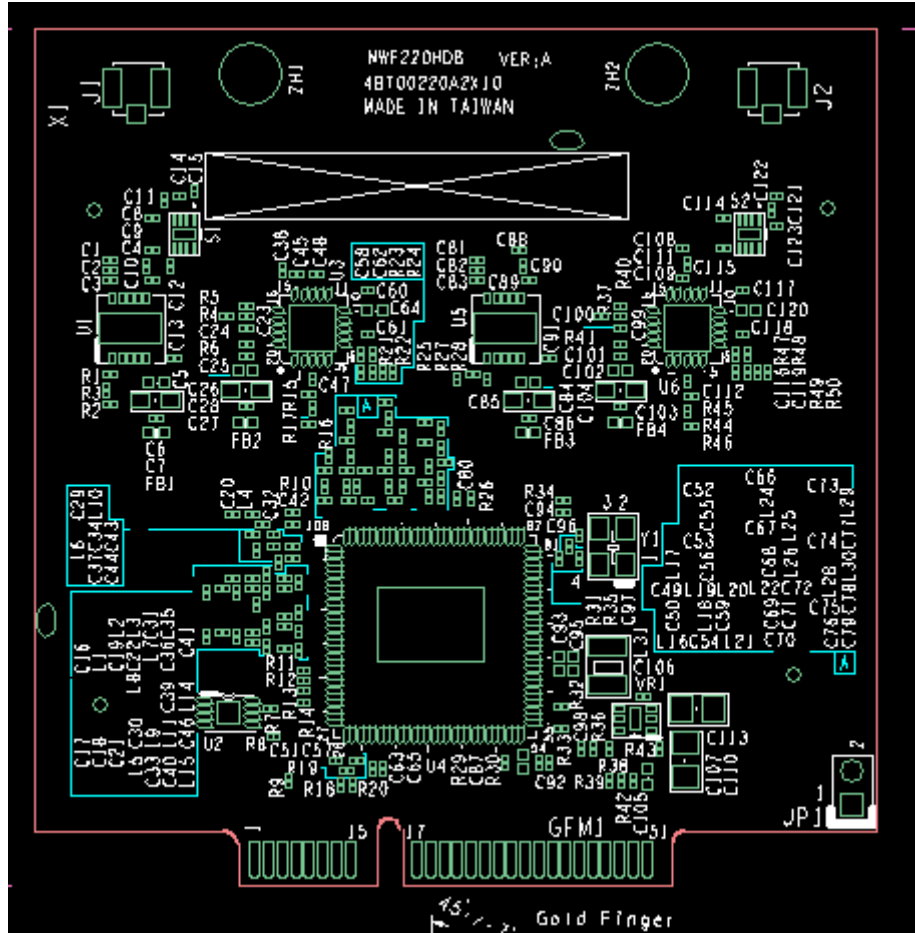
<b>Main Chip</b>	AR9382 Dual-Band 2 x 2 MIMO 802.11 an WLAN Single chip
<b>Memory</b>	OTP
<b>Crystal</b>	XTAL,SMD,40MHz,4pin,21ppm,3.2X2.5MM
<b>PA</b>	SE5023L, 5 GHz, 26dBm Power Amplifier with Power Detector SKY65174-21, 2.4GHz,26dBm Power Amplifier with Power Detector
<b>Power Supply</b>	DC 5V&3.3V (5V used to external PA)
<b>MIMO</b>	2.4GHz/5GHz, 2T2R
<b>I/O interface</b>	mPCI-E
<b>Temperature spec</b>	-20~+80
<b>PCB Size</b>	50x50.8mm
<b>Output Power</b>	5GHz: 18dBm@MCS15 per chain 2.4GHz: 21dBm @ MCS15 per chain

## 2.-- System Block Diagram



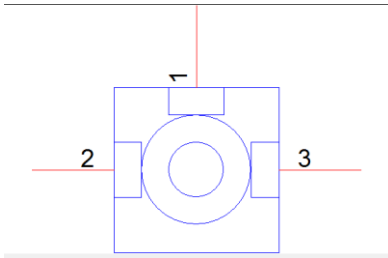
### 3.--PCB Board outline\ Connector pin definition\ Jumper setting

#### 3.1 -- PCB Board outline

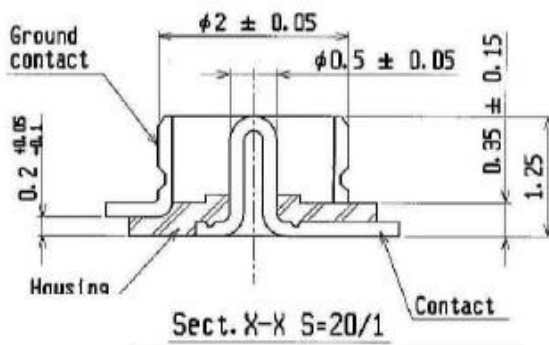
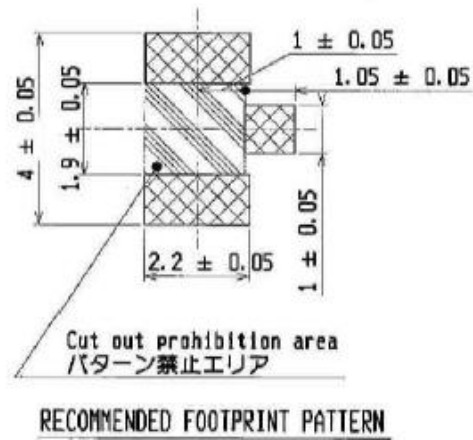
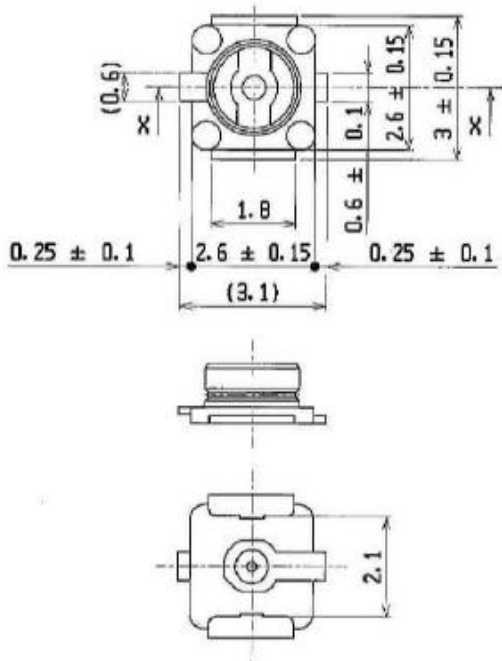


### 3.2- Connector Pin define

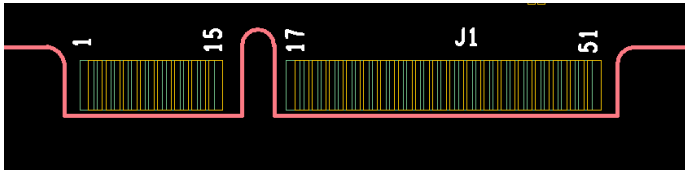
#### 3.2.1 IPEX connector



PIN	Definition
1	RF_IN
2	GND
3	GND



### 3.2.2 Gold Finger



PIN	Definition	PIN	Definition
1	WAKE_L	2	3.3V
3	RESERVED	4	GND
5	RESERVED	6	NC
7	CLKREQ_L	8	NC
9	GND	10	NC
11	REFCLK-	12	NC
13	REFCLK+	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	W_DISABLE_L
21	GND	22	PERST_L
23	PERn0	24	3.3VAUX
25	PERp0	26	GND
27	GND	28	NC
29	GND	30	NC
31	PETn0	32	NC
33	PETp0	34	GND
35	GND	36	USB_D-
37	NC	38	USB_D+
39	3.3V	40	NC
41	3.3V	42	NC
43	GND	44	LED_WLAN_L
45	RESERVED	46	NC
47	RESERVED	48	NC
49	5V	50	GND
51	5V	52	3.3V

## 4. RF performance

### RF output power: IEEE 802.11a/n

- IEEE802.11a
  - ✓ 24dBm@6M
  - ✓ 21dBm@54M
- IEEE802.11a/n HT20
  - ✓ 24dBm@MCS0
  - ✓ 21dBm@MCS7
- IEEE802.11a/n HT40
  - ✓ 26dBm@MCS0
  - ✓ 23dBm@MCS7

### Receive Sensitivity: IEEE 802.11a/n

- IEEE802.11a
  - ✓ -95dBm@6M
  - ✓ -80dBm@54M
- IEEE802.11a/n HT20
  - ✓ -95dBm@MCS0
  - ✓ -76dBm@MCS7
- IEEE802.11a/n HT40
  - ✓ -92dBm@MCS0
  - ✓ -75dBm@MCS7

**RF output power: IEEE 802.11b/g/n**

- IEEE802.11b
  - ✓ 24dBm@6M
- IEEE802.11g
  - ✓ 21dBm@54M
- IEEE802.11b/g/n HT20
  - ✓ 27dBm@MCS0
  - ✓ 24dBm@MCS7
- IEEE802.11b/g/n HT40
  - ✓ 26dBm@MCS0
  - ✓ 23dBm@MCS7

**Receive Sensitivity: IEEE 802.11b/g/n**

- IEEE802.11b
  - ✓ -93dBm@6M
- IEEE802.11g
  - ✓ -75dBm@54M
- IEEE802.11b/g/n HT20
  - ✓ -91dBm@MCS0
  - ✓ -73dBm@MCS7
- IEEE802.11b/g/n HT40
  - ✓ -90dBm@MCS0
  - ✓ -72dBm@MCS7



## 2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies.

DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.<sup>3</sup>

Explanation: This module meets the requirements of Part 15 Subpart C Section 15.247 and Part 15 Subpart E Section 15.407

## 2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT uses external antenna, antenna gain: 7dBi. There is no restriction on the installation method

## 2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is a limited module

## 2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.<sup>4</sup>

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the

module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: Yes. The module without trace antenna designs

## 2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable –

xx cm from a person’s body); and (2) additional text needed for the host product manufacturer to provide

to end users in their end-product manuals. If RF exposure statements and use conditions are not provided,

then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This module is designed to comply with the FCC statement, FCC ID is: 2AVW3-MWF220HDB

## 2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example

with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique

antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT uses external antenna, antenna gain: 7dBi.

## 2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated by the following texts: "Contains FCC ID: 2AVW3-MWF220HDB

## 2.9 Information on test modes and additional testing requirements<sup>5</sup>

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a standalone

modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for

different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: Data transfer module demo board can control the EUT work in RF test mode at specified test channel

## 2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer

is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a

notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.<sup>6</sup>

## Warning:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE: This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter

### RF Exposure Statement

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance of 20cm the radiator your body. This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter