

17WFM21

Product Specification and User Manual



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Author	Note	Date	Version
Emre Ardalı	Initial Draft	16.04.2019	V1.0
Emre Ardalı	Add info note for country regulations and tabulate module current consumption	16.05.2019	V1.1
Emre Ardalı	Add max output power for transmitter	20.05.2019	V1.2
Hakan Falakalıoğlu	Add FCC statements; add List of applicable FCC-rules and Test modes sections	21.01.2020	V1.3
Hakan Falakalıoğlu	Add new statements to Hardware Installation section	28.08.2020	V1.4
Hakan Falakalıoğlu	Tables in RF Characteristic section and Country Regulations section are updated List of applicable FCC-rules section is removed	02.09.2020	V1.5
Hakan Falakalıoğlu	Add FCC/IC warning section and update RF Characteristic table	21.10.2020	V1.6

Information given in this document may change without any notification.

1. General Description

The 17WFM21 WI-FI module design is a highly integrated MIMO wireless LAN (WLAN) used for high speed wireless local network access. The card is built with 2T2R capable RF/baseband single chip.

The 17WFM21 WI-FI module design implements multiple input, multiple output (MIMO) orthogonal frequency division multiplexing (OFDM) with 2 transmit and 2 receive paths and is compatible with 802.11 a/b/g/n specifications.

For legacy compatibility, direct sequence spread spectrum (DSSS), complementary code keying (CCK) and OFDM baseband processing are included to support all 802.11b, and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability, are available along with complementary code keying to provide the data rates of 1, 2, 5.5 and 11Mbps with long or short preamble. The high speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, and 64QAM modulation of the individual subcarriers and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provides the maximum data rate of 54 Mbps and 300 Mbps phy rate for IEEE 802.11g and 802.11n MIMO OFDM respectively. Module has no DFS (Dynamic Frequency Selection) and is only a DFS Client.

2. Features

- IEEE 802.11a/b/g/n standards
- 2.4 & 5 GHz dual band, HT20 & HT40
- 2x2 MIMO
- Phy-rates up to 300Mbps
- USB interface
- Printed PIFA antennas

3. Key Specifications

Main chipset	MT7600, Mediatek
Frequency range *	2402-2482 Mhz, 5170-5330 Mhz, 5490-5710 Mhz
Channels support *	CH 1-13, CH 36-64, CH100-140
Host interface	USB 2.0

* Country code control by host device

4. Electrical Specification

4.1. Power supply voltages

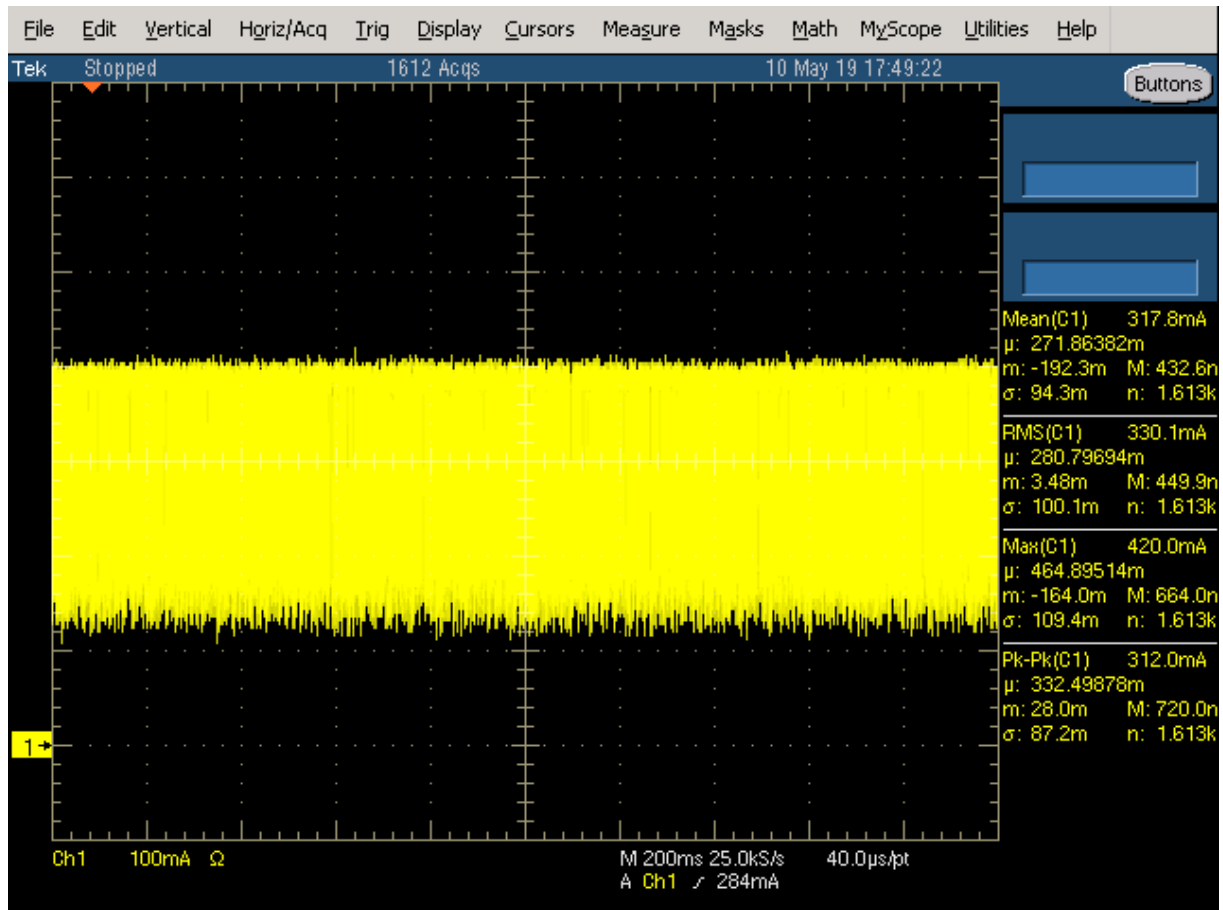
DC supply to module	Min	Typ	Max
VCC	4.75V	5 V	5.25 V

4.2. Current consumption

Note (VCC 5V)	Typ (mA rms)	Max peak (mA)
2.4G HT20 Ch6, RX mode *(1)	175	348
2.4G HT20 Ch6, TX mode *(1)	261	352
5G HT20 Ch48, RX mode *(1)	199	420
5G HT20 Ch48, TX mode *(1)	323	412
5G HT40 Ch64, RX mode *(1)	273	420
5G HT40 Ch64, TX mode *(1)	330	420
Idle *(2)	137	-

*(1) Measured while data streaming over iperf program

*(2) Idle means, it is connected to access point but no data streaming, ch6, HT20



5G HT40 Ch64, TX mode current wave form (VCC 5V)

4.3. Thermal characteristics

Operating temperature is 65 degree. Tj max 125 degree for wifi chip.

5. RF Characteristic

5.1 Wi-Fi

Typical power levels for wi-fi radio are given in figure below.

	2.4G BAND			
Standard	802.11b	802.11g	802.11n	802.11n
Modulation	DSS,CCK	OFDM	OFDM	OFDM
Data Rate	1,2,5.5,11	6,9,12,18,24,36,48,54	MCS0 - 7 (HT20)	MCS0 - 7 (HT40)
Channel*	CH 1-13	CH 1-13	CH 1-13	CH 1-13
Power (dBm)	12,5	12,5	12,5	12,5
	5G BAND			
Standard	802.11a	802.11n	802.11n	
Modulation	OFDM	OFDM	OFDM	
Data Rate	6,9,12,18,24,36,48,54	MCS0 - 7 (HT20)	MCS0 - 7 (HT40)	
Channel*	CH 36-64/ CH 100-140	CH 36-64/ CH 100-140	CH 36-64/ CH 100-140	
Power (dBm)	10.5 / 11	10.5 / 11	10.5 / 11	

*See country regulations

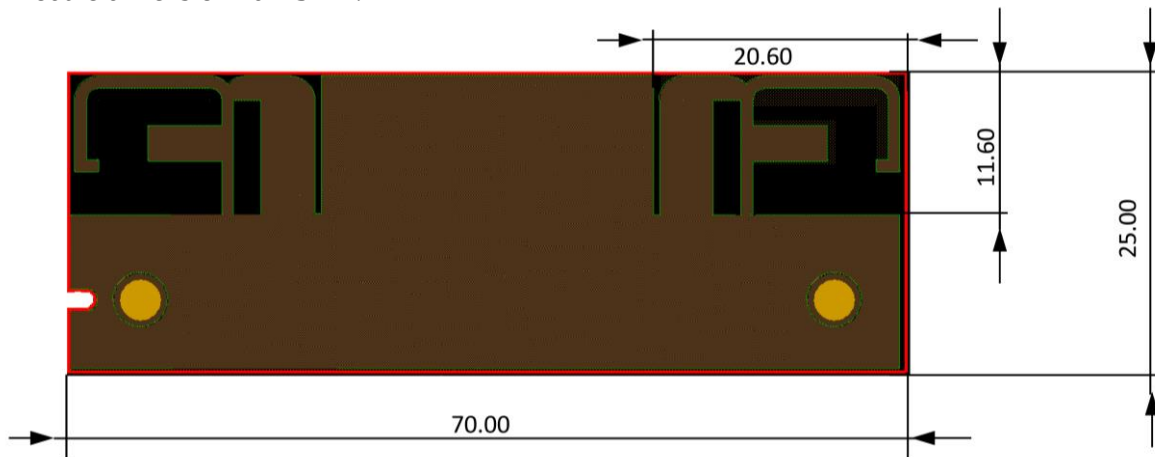
6. Antenna Characteristic

6.1. Antenna Gains

	2.4 Ghz	5 Ghz low band (5180 to 5320) (ch 36-64)	5 Ghz medium band (5500 to 5700) (ch100-140)
Antenna 0	3,4 dBi	2,97 dBi	3,69 dBi
Antenna 1	2,12 dBi	3,7 dBi	3,68 dBi

7. Mechanical Characteristics

- Module dimension 70x25mm.



8. Pin Description

Pin No.	Pin Name	I/O	Pin Description
1	VCC	I	VCC 5V
2	VCC	I	VCC 5V
3	USB_DN	I/O	USB Communication Signal
4	USB_DP	I/O	USB Communication Signal
5	GND	-	Ground
6	GND	-	Ground
7	WoWLAN	I/O	Wake on Wireless LAN Control Signal
8	NC	-	Not Connected

9. Block diagram

10.Environmental

10.1. Operating

Operating Temperature: 0 to 65 °C

Relative Humidity: 5-60% (non-condensing)

10.2. Storage

Temperature: -20 to 80 °C

Relevant Humidity: 5-85% (non-condensing)

11.Hardware & Software installation

11.1. Hardware Installation

17WFM21 module is a build in module. It will be used in-house production as an embedded device over USB 2.0 interface and there is no need any interaction with end-user. Positioning of the module is defined by assembly operator instructions for each product by Vestel.

The recommended installation of 17WFM21 module is shown below. The WI-FI module should be mounted by considering operating temperature. The temperature of the installation location should be between 0°C and 65 °C.

The module can be installed in mobile or fixed hosts. For portable devices a minimum separation distance of “45mm” between the antenna and the human body shall be observed to avoid SAR requirements. The implementation of the module in a specific end-product should also be reviewed to ensure compliance with the FCC and IC requirements for SAR and MPE.

11.2 Software Installation

The SW driver is already installed to host device software platform which is a Linux/Android OS. Proper country information must be selected from UI during first time boot up settings. Country information is used to disable (deactivate) channels/frequency ranges which are not allowed by country regulations.

12. FCC/IC Warning

The host integrator must follow the integration instructions provided by Vestel and ensure that the composite-system end product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules and to KDB Publication 996369.

Host label shows the FCC and ISSED identifier of the module. FCC and ISSED identifier will be visible on the back cover of the host device. Also, the modular transmitter meets only FCC and ISSED authorized for the specific rule parts, and the host must show complains with his own rule parts.

The module 17WFM21 has been tested and approved as a Modular Radio in accordance with the appropriate FCC and IC standards. The supporting test data may be found in the modular test report.

Since this module has been certified as a Modular Radio, this allows the end user to integrate this module into an end-product without the requirement of re-certifying the radio module. The module-integrator is responsible for the unintentional conducted and radiated emissions and must verify that the integrated product is compliant with the rules associated with unintentional radiators. The module integrator is also required to maintain an engineering record of the verification testing and declare on the product through proper labeling and marking that the device is compliant with these particular rules. Although already certified, radio tests according to KDB996369 clause 3.4 have to be carried out also.

Installed module's FCC ID and IC numbers need to be clearly marked on the product with the following verbiage "Contains FCC ID: 2AVQS-17WFM21" and "Contains IC: 25888-17WFM21".

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: This device may not cause harmful interference, and 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.

Antenna connector ports are not for use on board. And module is only allowed to use with the on board printed antennas.

Vestel provides user notices in both English and French when the product is made available for sale and/or lease in Canada. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;

2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

13. Country Regulations

Device is intended for home and office use in all countries and countries may have their own regulations to prohibit some wlan frequencies. Proper country information must be selected from UI during first time boot up settings. Country information is used to disable (deactivate) channels/frequency ranges which are not allowed by country regulations. Below are notes on use of devices in countries. For further information please refer to product IB or consult country regulatory organization.

Country	Restriction
Bulgaria	General authorization required for outdoor use and public service
France	In-door use only for 2454-2483.5 MHz
Italy	If used outside of own premises, general authorization is required
Greece	In-door use only for 5470 MHz to 5725 MHz band
Luxembourg	General authorization required for network and service supply (not for spectrum)
Norway	Radio transmission is prohibited for the geographical area within a radius of 20 km from the centre of Ny-Ålesund
Russian Federation	In-door use only
Israel	5 GHz band only for 5180 MHz-5320 MHz range
Canada	In-door use only for 5150 MHz to 5250 MHz band
USA / Canada	In the 2.4GHz Band channel 12 and 13 are disabled and for 802.11n (40) only CH 3-9 are enabled

Basic transmitter specification is given below figure;

Frequency Ranges	Max Output Power (eirp)
2400 - 2483,5 MHz (CH1-CH13)	< 100 mW
5150 - 5250 MHz (CH36 - CH48)	< 200 mW
5250 - 5350 MHz (CH52 - CH64)	< 200 mW
5470 – 5725 MHz (CH100 - CH140)	< 200 mW

14. Test modes

Test tools of Mediatek (QA tool) allow to configure test modes for different operational conditions.

Below steps should have been followed for testing Tx on module.

1. Select channel.
2. Select modulation type.
3. Select data rate.
4. Select bandwidth.
5. Select Tx0/Tx1 to set transmit port.
6. Click start Tx (Repeat 0 means never stop).

MT7662 QA V1.0.3.23

PCI Config | TX/RX | EEPROM | EEPROM2 | MAC BBP | RF Page | About | NOR-Flash

MAC Address: 944444000004 Set

Radio On/Off: On Off Accessory

Channel: 1 2412-MHz Mode: OFDM Rate: MCS=7; 54 Mbps System BW: 20 Per-Pkt BW: 20 Primary Sel.: 0 TX BF: None

1: set channel 2: set modulation 3: Phy Rate 4: Nss, Bandwidth

TX Frame Type: [15] Data Set Tx/D

TX frame setting:

FC (2)	Dur (2)	Address1 (6)	Address2 (6)	Address3 (6)	Seq (2)
0800	0000	FFFFFFFFFFFF	944444000004	000A40AABCC	0000

Repeat: 1000 LoopBack: ☐ IPG: 200 TX Power0 (Hex): [0.5dB] TX Power1 (Hex): [0.5dB] Freq. Offset: 5D Calibrate

6: Start TX 7: Calibrate Frequency Offset 8: Adjust TX Power Frequency Offset 5: Select TX0/1

Repeat=0 means
Never stop TX.

8: Adjust TX Power Frequency Offset

5: Select TX0/1

Below steps must be followed for testing Rx on module.

PCI Config | TX/RX | EEPROM | EEPROM2 | MAC BBP | RF Page | About | NOR-Flash

MAC Address: 000000000000 Set

Radio On/Off: On Off Accessory

Channel: 36 5180-MHz Mode: HT MxMode Rate: MCS=7; 65 Mbps System BW: 20 Per-Pkt BW: 20 Primary Sel.: 0 TX BF: None PTSCA: Deal

TX Frame Type: [15] Data Set Tx/D

TX frame setting:

FC (2)	Dur (2)	Address1 (6)	Address2 (6)	Address3 (6)	Seq (2)
0800	0000	FFFFFFFFFFFF	000000000000	000A40AABCC	0000

Repeat: 1000 LoopBack: ☐ IPG: 200 TX Power0 (Hex): [0.5dB] TX Power1 (Hex): [0.5dB] Freq. Offset: 3B Calibrate

RX Error/Decoded:

Field	Value
FCS error	277 / 5263
RX overflow	0 / 0
PHY error	0 / 0
False CCA	3 / 37
Frame Loss	0%

RX Okay:

Field	Value
U2M DATA	0 / 0
Other DATA	3606 / 65200
Packet	0 / 0
Others (Mgmt/Cnt)	0 / 0
FER	0.00%

RSSI tune:

Field	Value
RSSI1	-79 dBm Offset: 00
RSSI2	-xx dBm Offset: 00
RSSI0	-72 dBm Offset: 00

Freq. Deviation: 4.00 KHz / 0.73 ppm

Auto Responder: ☐ BBP Temp. Com: ☐ Temp. Cal: ☐ Stop RX: Reset counter: Capture Mode: Load Data: Dump Log: Set Tx End: Dump DMA:

1. Other data: Received packet successfully in the second.
2. FCS error: Failed to receive packet
3. False CCA: false alarm to receive packet which can indicate how noisy in test environment
4. The sensitivity level is determined by other data 90% (10% PER) of transmitted packet per second
5. RSSI: the received packets signal indicator, -72dBm in the case.