

Product External Specifications For 802.11b/g/n 2x2 USB Module

(MTK RT5372)

Customer : TPV

Model P/N TPV : 317GAAWF506ALP Alpha : TPWUSN24V2A1G

Model Number: WUS-N24V2

Version : 1.3



Revision History

Rev.	Date	Author	Reason for Changes
1.0	2013/07/01	Yu-Chun Yu	Draft Release
1.1	2013/08/06	Doreen Chang	• Add packing and the photo of module
1.2	2013/8/19	Doreen Chang	Add model number in cover page
1.3	2014/08/01	Doreen Chang	Add FCC ID information



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i. Install Driver

1. install the test driver

NRT5x7x V1.0.8.0\RT5x7x V1.0.8.0\x86 Driver RT2870QA.inf 安装信息 8 KB 8 KB 8 KB

- 2. TX signal command
 - (1) select TX/RX site
 - (2) select channel,datarate,bandwidth and chain0/1
 - (3) for continue TX select conti, press start tx; for continue packets tx, set repeat to 0, press start tx

Address DOAEEC671025	Set				hip Info T2182 :: 2 T 2 R ExtLNA =
nnel 1 2412-MHz 💌	Made OFDM	• Rate CS=7; 54	Mbps 💌 H	andwith 20 -	TxBandSel Low -
		r.n 🔽 Aggregat 🔽 Temp.	Com E Try ALC	□ 5TBC 🔽 2 4G	Side Band Onti
Frame Type [15] Data	▼ Set I	CxD 1 Cal Temp	store first in the state of the state of the		Di Antenna diversity
X frame setting FC Dur Address1	(6) Addre	ss2 Address3 (6)	Seq		C Main C Aux
0800 0000 FFFFFF		001122334455		e	IQ Compensation
- Pavload	Pavload	l Repeat	SW CRC Check	Total	Gain Phase
🖵 Debu;		AA	SW CRC	1058	Tx0 FF : FF : Enable
T Inc					Tx1 FF + FF + Calibrate
	abada TRG	200 TX P	owerO TX P		
epeat 1000 Los		(0	1.5dB (0	ower1 5dB Freq.	Offset
epeat 1000 Lo. Start <u>IX</u> Transmitte		Conti 1 Carrier t	0.548 (C	ower1 5dB Freq.	Offset 0 salibrat. C DAC 0
		Conti 1 Carrier t	0.548 (C	ower1 5dB 12	Offset ·alibrat. C DAC 0
		Conti 1 Carrier t	0.548 (C	ower1 5dB Freq.	Offset 0 salibrat. C DAC 0
Start <u>TX</u> Transmitte		Conti 1 Carrier t	0.548 (C	ower1 5dB Freq.	Offset 0 salibrat. C DAC 0
Start IX Transmitte		Conti 1 Carrier ti Carrier Suppress:	0.548 (C	owerl SdB I2 3 librate RSSI tune	Offset 0 salibrat. C DAC 0
Start IX Transmitter	a of	Conti 1 Carrier ti Carrier Suppress:	1.5dB (0 0D + Ca librate Ca	overi .5dB 12 .12 .5dB	Offset alibret: C DAC 0 C DAC 1
Start IX Transpitte RX Error (Dropped) FCS error	a 0/0	EX Okay U2M DATA :	0.5dB (C 00 + Ca librate Ca 0 / 0	overi .5dB 12 - 3 librate RSSI tune RSSI = xx dE RSSI2 = xx dE	Offset O :alibret: O DAC 0 O DAC 1 mOffse Calibrate
Start IX Transmitte RX Error (Dropped) FCS error RX overflow	a 0/0 0/0	RX Okay U2M DATA : other DATA :	0.5dB (0 00 ÷ librate Ca 0 / 0 0 / 0	overi .5dB 12 - 3 librate RSSI tune RSSI = xx dE RSSI2 = xx dE	Offset 0 :alibret: DAC 0 DAC 1 m Offse ÷ Calibrate m Offse ÷ Calibrate
Start IX Transmitte RX Error (Dropped) FCS error RX overflow PHY error :	a 0/0 0/0 0/0 0/0	Contil 1 Carrier to Carrier Suppress: EX Okay U2M DATA : other DATA : BEACON :	0.5dB (0 0) + librate Ca 0 / 0 0 / 0 0 / 0	overi .5dB 12 - 3 librate RSSI tune RSSI = xx dE RSSI2 = xx dE	Offset 0 :alibret: DAC 0 DAC 1 m Offse ÷ Calibrate m Offse ÷ Calibrate
Start IX Transmitte RX Error (Dropped) FCS error RX overflow PHY error : False CCA	a 0 / 0 0 / 0 0 / 0 0 / 0 0 / 0	Contil 1 Carrier to Carrier Suppress: Ca RX Okay U2M DATA : other DATA : BEACON : others (Mgmt/Cnt	0.5dB (0 0) + (11brate Ca 0 / 0 0 / 0 0 / 0 0 / 0 0 / 0	overi 5dB 12 - RSSI tune RSSI = xx dI RSSI2 = xx dI RSSI2 = xx dF RSSI0 = xx dF Freq. Deviation	Offset O:alibrat: DAC 0 DAC 1 mOffse ÷ Calibrate mOffse ÷ Calibrate moffse ÷ Calibrate



- 3. RX signal command
 - (1) select TX/RX site
 - (2) select channel, datarate and chain 0/1

		5			Chip Info
Address DOAEEC671025	Set				RT2182 :: 2 T 2 R ExtLNA =
unel 1 2412-MHz	Node OFDM	Rate MCS=7; 54	Mbps V B	andwidth 20	▼ TxBandSel Lower ▼
rame Type [15] Data	💌 Set I				
frame setting		Cal Temp	o. Cal TSSI	J D SGI J A	-MPDU Antenna diversity
C Dur Addressi (6			Seq		C Main C Aux
0800 0000 FFFFFFFFF	FF DOAEE	001122334455	0000		- IQ Compensation
Payload	Payload		SW CRC Check	Total	Gain Phase Tx0 FF + FF + Enable
Debug I:	af h	AA	SW CRC	1058	Tx1 FF + FF + Calibrate
					101 11 - 11 -
epeat 1000 [Loopb	ack IPG	200 TX Pc		ower1 Fr	req. Offset
epeat 1000 🔽 Loopb Start <u>T</u> X Transmitted	0 1	Conti. 1 Carrier to	.548 (0	.5dB Fr	req. Offset
	0 1	Conti. 1 Carrier t.	.548 (0 00 🛨 🔽		req. Offset
	0 1	Conti. 1 Carrier t.	.548 (0 00 🛨 🔽	.54B	req. Offset 30 alibrat C DAC 0
Start IX Transmitted	0 1	Conti. 1 Carrier to Carrier Suppress:	.548 (0 00 🛨 🔽	12 - Ilibrate	req. Offset 30 alibrat C DAC 0
Start IX Transmitted	• -	Conti. 1 Carrier to Carrier Suppress:	.5dB (0 OD : Ca Librate Ca	.5dB Fr 12 + F librate -	req. Offset 30 :alibrat > CDAC 0 CDAC 1
Start IX Transmitted RX Error (Dropped) FCS error	° F	Conti. 1 Carrier to Carrier Carrier Suppress: Cal	5dB (0 00 ÷ Librate Ca 0 / 0	SdB Fr 12	req. Offset 30 :alibrat A dBm Offse Calibrate
Start IX Transmitted RX Error (Dropped) FCS error RX overflow	0 F 0/0	Conti. 1 Carrier to Carrier Carrier Suppress: Call	.5dB (0 OD : Ca Librate Ca	SdB Fr 12	req. Offset 30 (alibrat) * dBmOffse * dBmOffse * Calibrate Calibrate
Start IX Transmitted RX Error (Dropped) FCS error	° F	Conti. 1 Carrier to Carrier Carrier Suppress: Cal	5dB (0 00 ÷ Librate Ca 0 / 0	SdB Fr 12 - I librate - SSSI tune RSSI tune RSSI1 = x RSSI2 = x	req. Offset 30 :alibrat A dBm Offse Calibrate
Start IX Transmitted RX Error (Dropped) FCS error RX overflow	0 F 0/0	Conti. 1 Carrier to Carrier Carrier Suppress: Cal	.548 (0 0) + Ca Librate Ca 0 / 0 0 / 0	SdB fr 12 12 12 Librate - RSSI tune RSSI = x RSSI2 = x RSSI0 = x	req. Offset 30 :alibrat * dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate
Start IX Transmitted RX Error (Dropped) FCS error RX overflow FHY error :	0 F	Conti. 1 Carrier to Carrier Suppress: EX Okay U2M DATA : other DATA : BEACON :	.548 (0 0) + Librate Ca 0 / 0 0 / 0 0 / 0	SdB Fr 12 - I librate - SSSI tune RSSI tune RSSI1 = x RSSI2 = x	req. Offset 30 :alibrat * dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate
Start IX Transmitted EX Error (Dropped) FCS error EX overflow FHY error : False CCA	0 F 0 / 0 0 / 0 0 / 0 0 / 0	Conti. 1 Carrier to Carrier Suppress: EX Okay U2M DATA : other DATA : BEACON : others (Mgmt/Cnt	.5dB (0 0) + (0 librate Ca 0 / 0 0 / 0 0 / 0 0 / 0 0 / 0 0 / 0 0 / 0	SdB fr 12 - librate - RSSI tune RSSI1 = x RSSI2 = x RSSI0 = x Freq. Deviati	req. Offset 30 :alibrat * dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate x dBmOffse - Calibrate

1.1 Scope

1.2 Document

This document is to specify the product requirements for **802.11n USB Module with onboard metal antenna**. This USB module is based on MTK Ralink single chip that complied with 802.11n standard from 2.4~2.5GHz, and it can be used to provide up to 11Mbps for IEEE 802.11b, 54Mbps for IEEE 802.11g and 300Mbps for 802.11n to connect your wireless LAN.

With seamless roaming, fully interoperability and advanced security with WEP standard, **802.11n USB Module** offers absolute interoperability with different vendors' 802.11b, 802.11g, and 802.11n Access Points through the wireless LAN.

1.3 Product Features

- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate
- Compatible with IEEE 802.11n standard to provide wireless 300Mbps data rate



- Supports infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- Supports WEP, 802.1x, WPA and WPA2 enhanced security
- Friendly user configuration and diagnostic utilities
- Drivers support Windows XP, Vista, Win7.
- 6-pin pitch connector USB interface
- RoHS compliant
- Antenna type : Two onboard metal Antenna

2.0 Requirements

The following sections identify the detailed requirements of 802.11b/g/n embedded USB Module



2.2 General Requirements

2.2.1 IEEE 802.11b Section

#	Feature	Detailed Description
2.2.1.1	Standard	• IEEE 802.11b
2.2.1.2	Radio and	• DQPSK, DBPSK, DSSS, and CCK
	Modulation	
	Schemes	
2.2.1.3	Operating	• 2400 ~ 2483.5MHz ISM band
	Frequency	
2.2.1.4	Channel Numbers	• 11 channels for United States
		13 channels for Europe Countries and other regions
2.2.1.5	Data Rate	• 11, 5.5, 2, and 1Mbps
2.2.1.6	Media Access	CSMA/CA with ACK
	Protocol	
2.2.1.7	Transmitter Output	• Typical RF Output Power at each RF chain, Data Rate and at room
	Power	Temp. 25degree C
		• 16 dBm(±2dB) at 1,2,5.5,11Mbps
2.2.1.8	Receiver Sensitivity	• Typical Sensitivity at each RF chain. Frame (1000-byte PDUs) Error
		Rate = 8%
		• -76 dBm at 1Mbps
		• -76 dBm at 2Mbps
		• -76 dBm at 5.5Mbps
		• -76 dBm at 11Mbps
2.2.1.9	Receiver Maximum	The Receiver shall provide a maximum PER of 8 % at a PSDU length of
	Input Level	1000 bytes for a maximum input level of -10 dBm measured at each antenna
		for any baseband modulation



#	Feature	Detailed Description
2.2.2.1	Standard	• IEEE 802.11g
2.2.2.2	Radio and Modulation Schemes	• BPSK, QPSK, 16QAM, 64QAM, and OFDM
2.2.2.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
2.2.2.4	Channel Numbers	 11 channels for United States 13 channels for Europe Countries and other regions
2.2.2.5	Data Rate	• 6,9,12,18,24,36,48,54Mbps
2.2.2.6	Media Access Protocol	CSMA/CA with ACK
2.2.2.7	Transmitter Output Power	 Typical RF Output Power at each RF chain, Data Rate and at room Temp. 25degree C 16[±] 2dBm at 6,9 Mbps 15[±] 2dBm at 12,18 Mbps 15[±] 2dBm at 24,36 Mbps 14[±] 2dBm at 48,54 Mbps
2.2.2.8	Receiver Sensitivity	 Typical Sensitivity at each RF chain. Frame (1000-byte PDUs) Error Rate = 8% -82 dBm at 6Mbps -81 dBm at 9Mbps -79 dBm at 12Mbps -77 dBm at 18Mbps -74 dBm at 24Mbps -70dBm at 36Mbps -66dBm at 48Mbps -65 dBm at 54Mbps
2.2.2.9	Receiver Maximum Input Level	The Receiver shall provide a maximum PER of 10 % at a PSDU length of 1000 bytes for a maximum input level of -20 dBm measured at each antenna for any baseband modulation

2.2.3 IEEE 802.11n Section

#	Feature	Detaile	Detailed Description				
2.2.3.1	Standard	• I	EEE 802.11n				
2.2.3.2	Radio and Modulation Type	• E	• BPSK, QPSK, 16QAM, 64QAM with OFDM				
2.2.3.3	Operating Frequency	• 2	• 2400 ~ 2483.5MHz ISM band				
2.2.3.4	Data Rate						
			GI=800ns		GI=400ns		
		MCS	20MHz	40MHz	20MHz	40MHz	
		0	6.5	13.5	7.2	15	
		1	13	27	14.4	30	
		2	19.5	40.5	21.7	45	
		3	26	54	28.9	60	
		4	39	81	43.3	90	
		5	52	108	57.8	120	
		6	58.5	121.5	65.0	135	
		7	65	135	72.2	150	



#	Feature	Detailed Description					
		8	13	27	14.444	30	
		9	26	54	28.889	60	
		10	39	81	43.333	90	
		11	52	108	57.778	120	
		12	78	162	86.667	180	
		13	104	216	115.556	240	
		14	117	243	130.000	170	
		15	130	270	144.444	300	
2.2.3.5	Media Access Protocol	• (CSMA/CA with A	СК			
2.2.3.6	Transmitter Output Power at Antenna Connector	1	Typical RF Output Temp. 25degree C		RF chain, Data Ra	te and at room	
			2.4GHz Band/HT-2				
			3 ± 2 dBm at MCS				
		• 1	3±2dBm at MCS	2/3			
		• 1	3±2dBm at MCS	4/5			
			3±2dBm at MCS				
			2.4GHz Band/HT-4				
			3±2dBm at MCS				
		• 1	3±2dBm at MCS	2/3			
		• 1	3±2dBm at MCS	4/5			
		• 1	3± 2dBm at MCS	6/7			
2.2.3.7	Receiver Sensitivity at Antenna Connector	H H H H H H H H H H H H H H H H H H H	Fypical Sensitivity Error Rate <10% a HT-20 80 dBm at MCS 0 77 dBm at MCS 1 75 dBm at MCS 2 72 dBm at MCS 3 68 dBm at MCS 4 64 dBm at MCS 5 63 dBm at MCS 6 62 dBm at MCS 7 HT-40 77 dBm at MCS 0 74 dBm at MCS 1 72 dBm at MCS 3 65 dBm at MCS 3 65 dBm at MCS 5 60 dBm at MCS 5 60 dBm at MCS 7	nd at room Terr /8 /9 /10 /11 /12 /13 /14 /15 /8 /9 /10 /11 /12 /13 /14		ctets PSDUs).	
2.2.3.8	Receiver Maximum Input Level	The Re 1000 b	eceiver shall provid	le a maximum P m input level of		PSDU length of ed at each antenna	

2.2.4 eneral Section

#	Feature	Detailed Description
2.2.4.1	Antenna Type	Onboard metal Antenna



2.2.4.2	Operating Voltage	•	3.3VDC +/-10%
2.2.4.3	Current	•	450mA at continuous transmit mode @HT40 MCS0
	Consumption		315mA at receive mode w/o receiving packet @HT40 MCS0
2.2.4.4	Interface	•	6-pin pinch connector, wafer

2.3 Software Requirements

The Configuration Software supports Microsoft Windows XP, Vista, Win7. This configuration software includes the following functions:

• Information

Information allows you to monitor network status.

Configuration

Configuration allows you to configure parameters for wireless networking.

• Security

Supports enhanced security WEP, WPA and WPA2.

2.3.1 nformation

#	Feature	Detailed Description
2.3.1.1	General Information	• General Information shows the name of Wireless Adapter, Adapter MAC Address, Regulatory Domain, Driver Version, and Utility Version.
2.3.1.2	Current Link Information	 Current Link Information shows the Current Setting ESSID, Channel Number, Associated BSSID, Network Type, Security Status, Link Status, Signal Strength.
2.3.1.3	Site survey	• To search the neighboring access points and display the information of all access points.

2.3.2 Configuration

#	Feature	Detailed Description
2.3.2.1	ESS ID	• Input an SSID number if the roaming feature is enabled
		Supports for ASCII printable characters.
2.3.2.2	MAC	The MAC address of the wireless device
2.3.2.3	Signal	The link quality of the wireless connection
2.3.2.4	Security	• If there is a "lock" icon, it means the wireless network is secure.
		Must know the encryption key/security settings to connect.
2.3.2.5	Channel	The wireless network

2.3.3 curity

#	Feature	Detailed Description
2.3.3.1	Encryption	RC4 encryption algorithm
		Support 64/128 bit WEP encryption
		Support open system and shared key authentication
2.3.3.2	WEP Management	• Four WEP keys can be selected
	_	• STA with WEP off will never associate any AP with WEP enabled
		WEP Key Format: Option for Hex format



#	Feature	Detailed Description
2.3.3.4	WPA/WPA2	Support WPA/WPA2-PSK and WPA/WPA2-EAP
		Support Cipher Mode AES and TKIP

2.4 Mechanical Requirements

#	Feature	Detailed Description
2.4.1	Length	• $100 \text{mm} \pm 0.005 \text{mm} (\text{PCB})$
2.4.2	Width	• 17mm ±0.005mm (PCB)



2.5 Compatibility Requirements

This device passes the following compatibility requirements.

#	Feature	Detailed Description
2.5.1	Wi-Fi	Meet Wi-Fi certification for IEEE 802.11 product
2.5.2	Physical Layer and Functionality	Meet ALPHA Engineering Test Plan and Test Report

2.6 Requirements of Reliability, Maintainability and Quality

#	Feature	Detailed Description
2.6.1	MTBF	• Mean Time Between Failure > 30,000 hours
2.6.2	Maintainability	There is no scheduled preventive maintenance required
2.6.3	Quality	• The product quality is followed-up by ALPHA factory quality control
		system



#	Feature	Detailed Description
2.7.1	Operating Temperature Conditions	• The product is capable of continuous reliable operation when operating in ambient temperature of 0 $^{\circ}$ C to +50 $^{\circ}$ C.
2.7.2	Non-Operating Temperature Conditions	• Neither subassemblies is damaged nor the operational performance is degraded when restored to the operating temperature after exposing to storage temperature in the range of -20 °C to $+75$ °C.
2.7.3	Operating Humidity conditions	• The product is capable of continuous reliable operation when subjected to relative humidity in the range of 10% and 90% non-condensing.
2.7.4	Non-Operating Humidity Conditions	• The product is not damaged nor the performance is degraded after exposure to relative humidity ranging from 5% to 95% non-condensing

2.8 FCC ID

FCC ID: RRK-WUSN24V2

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.

Federal Communication Commission Interference Statement

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.

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 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.

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further <u>transmitter</u> test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions <u>can not be met</u> (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID <u>can</u> <u>not</u> be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: RRK-WUSN24V2. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.