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Product Specification

IEEE 802.11 a/b/g/n/ac WLAN with BT 2.1/3.0/4.0 USB Module
(Dual-Antenna with 5G external PA)

Project Name	Realtek RTL8821AU Combo Module
Model NO	F21AUUM13-W1
Customer	
Customer's Part NO	

Draft: Colin Ming	Check: Jim Hu	Approved: William Tan

Feedback of customer's Confirmation

We accept the specification after Confirmed.

Customer	Customer signature	Approved Date

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Revision History

Version NO.	Date	Modifications	Draft
Rev0.1	2014-05-12	First Released	Neal Yu
Rev0.2	2014-06-09	Add the outline drawing	Neal Yu
Rev0.3	2016-12-22	Add the shield cover	Colin Ming
Rev0.4	2018-07-12	Add Module Dimension tolerance	Jacky

1. Introduction

F21AUUM13-W1 is a highly integrated module 802.11a/b/g/n/ac 1T1R USB2.0 WLAN controller. It combines a WLAN MAC, a 1T1R capable WLAN baseband, BT Protocol Stack(LM,LL, and LE), BT baseband, modem, and WLAN/BT RF in the module. The module provides a complete solution for a high throughput performance integrated wireless LAN and Bluetooth device.

The F21AUUM13 WLAN baseband implements OFDM with 1 transmit and 1 receive path and is compatible with the 802.11ac specification. Features include one spatial stream transmission, short guard interval(GI) of 400ns, spatial spreading, and transmission over 20MHz, 40MHz and 80MHz channel bandwidth.

The F21AUUM13 Bluetooth controller complies with Bluetooth core specification v4.0, and supports dual mode(BR/EDR+AMP+LOW Energy Controllers). It is compatible with previous versions, including v2.1+EDR and v3.0+HS. For BR/EDR, it supports scatternet topology and allows four active links in slave mode, or links in master mode. For Low Energy, it supports multiple states and allows to link in BR/EDR and LE modes simultaneously.
The general hardware for the module is shown in Figure 1.

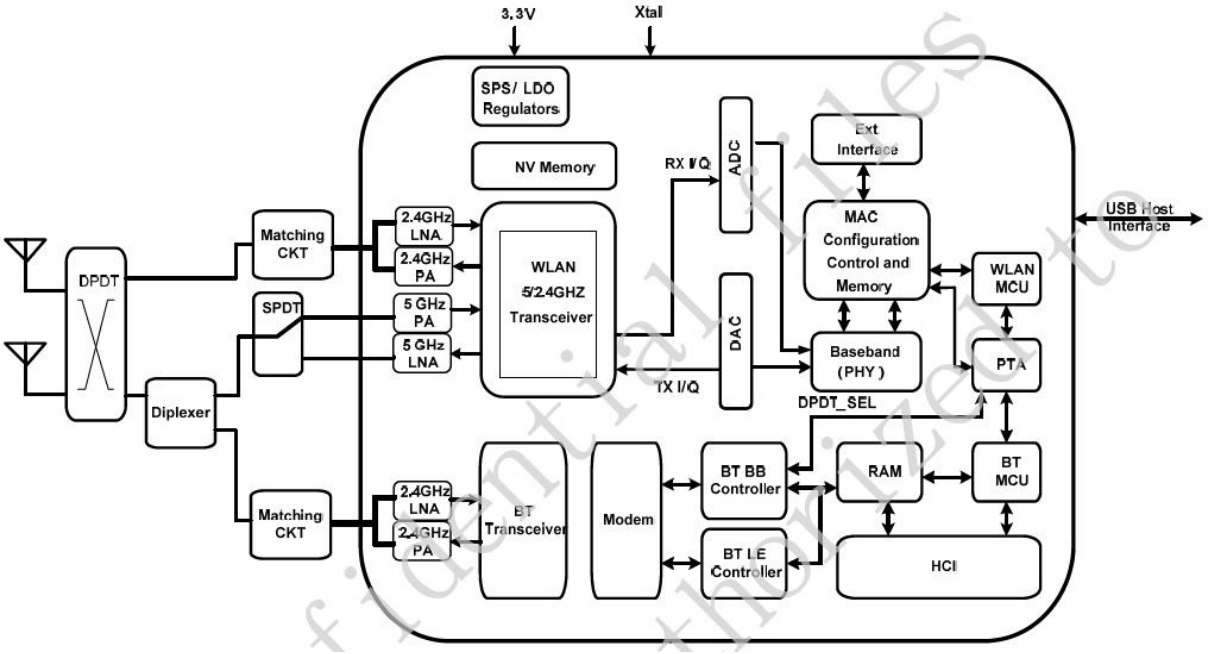


Figure 1

2. Features

- Support 802.11b/g/n/ac Draft 3.0 1T1R WLAN and Bluetooth
- Complies with USB2.0 for WLAN and BT controller
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps date rate
- Compatible with IEEE 802.11a standard to provide wireless 54Mbps date rate
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps date rate
- Compatible with IEEE 802.11n standard to provide wireless 150Mbps date rate
- Compatible with IEEE 802.11ac standard to provide wireless 433.3Mbps date rate
- Operation at 2.4~2.5GHz and 5.15~5.825GHz frequency band to meet worldwide regulations
- Provides simple legacy and 20MHz/40MHz/80MHz co-existence mechanisms to ensure backward and network compatibility.
- Supports infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- Supports IEEE 802.11i(WPA and WPA2). Open, shared key, and pair-wise key authentication services

- Bluetooth Low Energy Support
- Supports AFH to dynamically detect channel quality to improve transmission quality
- Fast AGC control to improve receiving dynamic range

3. GENERAL SPECIFICATION

3.1 WiFi Specifications

Features	Descriptions
Main Chipset	Realtek RTL8821AU
Operating Frequency	2.4G: 2.4000GHz～2.4835GHz 5G: 5.150GHz～5.825GHz
Host Interface	USB 2.0
Data Transfer Rate	**WiFi:** 802.11b: 1,2,5.5,,11Mbps 802.11a: 6,9,12,18,24,36,48,54Mbps 802.11g: 6,9,12,18,24,36,48,54Mbps 802.11n: MCS0~MCS7,up to 150Mbps 802.11ac: up to 433.3Mbps **BT:** 1 Mbps for Basic Rate 2,3 Mbps for Enhanced Data Rate
Modulation	**WiFi:** 802.11b: DBPSK, DQPSK, CCK 802.11 g/n: BPSK , QPSK , 16QAM ,64QAM with OFDM 802.11a: BPSK , QPSK , 16QAM ,64QAM with OFDM 802.11ac: BPSK , QPSK , 16QAM ,64QAM,256QAM with OFDM **BT:** 8DPSK, π /4 DQPSK, GFSK
Transmit Output Power	802.11b@11Mbps 16±2dBm 802.11g@6Mbps 15±2dBm 802.11g@54Mbps 15±2dBm 802.11n@65Mbps 14±2dBm (MCS 0_HT20) 14±2dBm (MCS 7_HT20) 14±2dBm (MCS 0_HT40) 14±2dBm (MCS 7_HT40) 802.11a@54Mbps 13±2dBm 802.11ac@MCS7 13±2dBm 802.11ac@MCS9 12±2dBm
Receiver Sensitivity Bandwidth: 20MHz (Typical Sensitivity at each RF chain at Which Frame(1000-byte PDUs)Error Rate=10% and at room Temp.25 degreeC)	802.11b@8% PER 1Mbps≤-83±1dBm 2Mbps≤-80±1dBm 5.5Mbps≤-79±1dBm 11Mbps≤-76±1dBm
	802.11g@10% PER 6Mbps ≤-82±1dBm 9Mbps ≤-81±1dBm 12Mbps ≤-79±1dBm 18Mbps ≤-77±1dBm 24Mbps ≤-74±1dBm 36Mbps ≤-70±1dBm 48Mbps ≤-66±1dBm 54Mbps ≤-65±1dBm

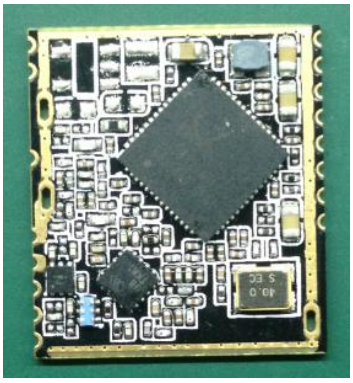
	802.11n@10% PER 2.4GHz Band/HT20 ● -82dBm at MCS0 ● -79dBm at MCS1 ● -77dBm at MCS2 ● -74dBm at MCS3 ● -70dBm at MCS4 ● -66dBm at MCS5 ● -65dBm at MCS6 ● -64dBm at MCS7	2.4GHz Band/HT40 ● -79dBm at MCS0 ● -76dBm at MCS1 ● -74dBm at MCS2 ● -71dBm at MCS3 ● -67dBm at MCS4 ● -63dBm at MCS5 ● -62dBm at MCS6 ● -61dBm at MCS7
	5GHz Band/HT20 ● -82dBm at MCS0 ● -79dBm at MCS1 ● -77dBm at MCS2 ● -74dBm at MCS3 ● -70dBm at MCS4 ● -66dBm at MCS5 ● -65dBm at MCS6 ● -64dBm at MCS7	5GHz Band/HT40 ● -79dBm at MCS0 ● -76dBm at MCS1 ● -74dBm at MCS2 ● -71dBm at MCS3 ● -67dBm at MCS4 ● -63dBm at MCS5 ● -62dBm at MCS6 ● -61dBm at MCS7
	802.11a@10% PER 6Mbps ≤-82±1dBm 9Mbps ≤-81±1dBm 12Mbps ≤-79±1dBm 18Mbps ≤-77±1dBm 24Mbps ≤-74±1dBm 36Mbps ≤-70±1dBm 48Mbps ≤-66±1dBm 54Mbps ≤-65±1dBm	
	802.11ac@10% PER 5GHz Band / HT20 ● -82dBm at MCS0 ● -79dBm at MCS1 ● -77dBm at MCS2 ● -74dBm at MCS3 ● -70dBm at MCS4 ● -66dBm at MCS5 ● -65dBm at MCS6 ● -64dBm at MCS7 ● -59dBm at MCS8 ● -57dBm at MCS9	5GHz Band / HT40 ● -79dBm at MCS0 ● -76dBm at MCS1 ● -74dBm at MCS2 ● -71dBm at MCS3 ● -67dBm at MCS4 ● -63dBm at MCS5 ● -62dBm at MCS6 ● -61dBm at MCS7 ● -56dBm at MCS8 ● -54dBm at MCS9
	5GHz Band / HT80 ● -76dBm at MCS0 ● -73dBm at MCS1 ● -71dBm at MCS2 ● -68dBm at MCS3 ● -64dBm at MCS4 ● -60dBm at MCS5 ● -59dBm at MCS6 ● -58dBm at MCS7 ● -55dBm at MCS8 ● -51dBm at MCS9	
Media Access Control	**WiFi:** CSMA /CA with ACK **BT:** AFH, Time Division	

Network Architecture	**WiFi:** Adhoc mode (Peer-to-Peer) Infrastructure mode Software AP WiFi Direct **BT:** Pico Net Scatter Net
Operating Channel	**WiFi:** 11: (Ch. 1-11) – United State 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan **BT:** Ch. 0-78
Security	**WiFi:** WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11x, IEEE 802.11i **BT:** Sample Pairing
RF Antenna	External Antenna
Operating Voltage	3.3±10% Vdc I/O supply voltage
Dimension	L19.0mm*W17.1mm*T2.0mm

4. Mechanical Specification

4.1 Outline drawing

<Top side>



P/N: FG21AUUM13-W1

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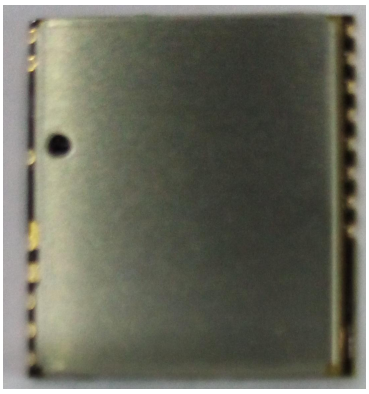


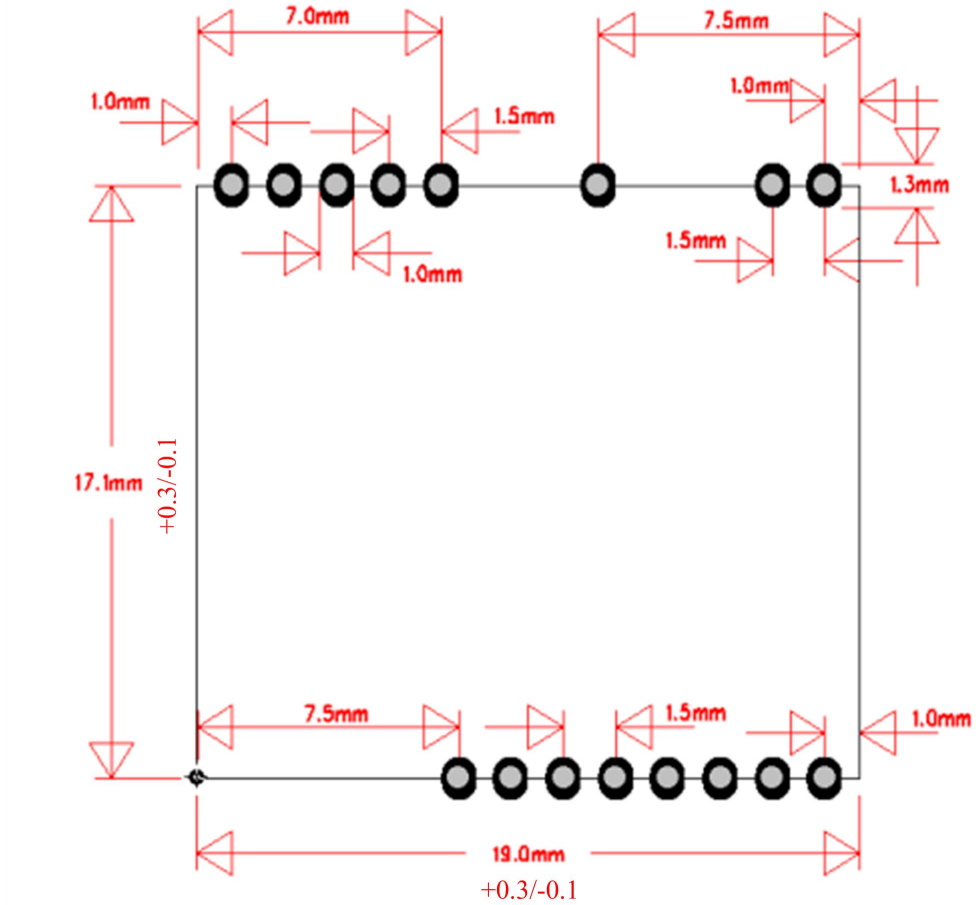
P/N: FG21AUUM13-W2

4.2 ordering information

P/N	Description
FG21AUUM13-W1	Module without shield cover
FG21AUUM13-W2	Module with shield cover

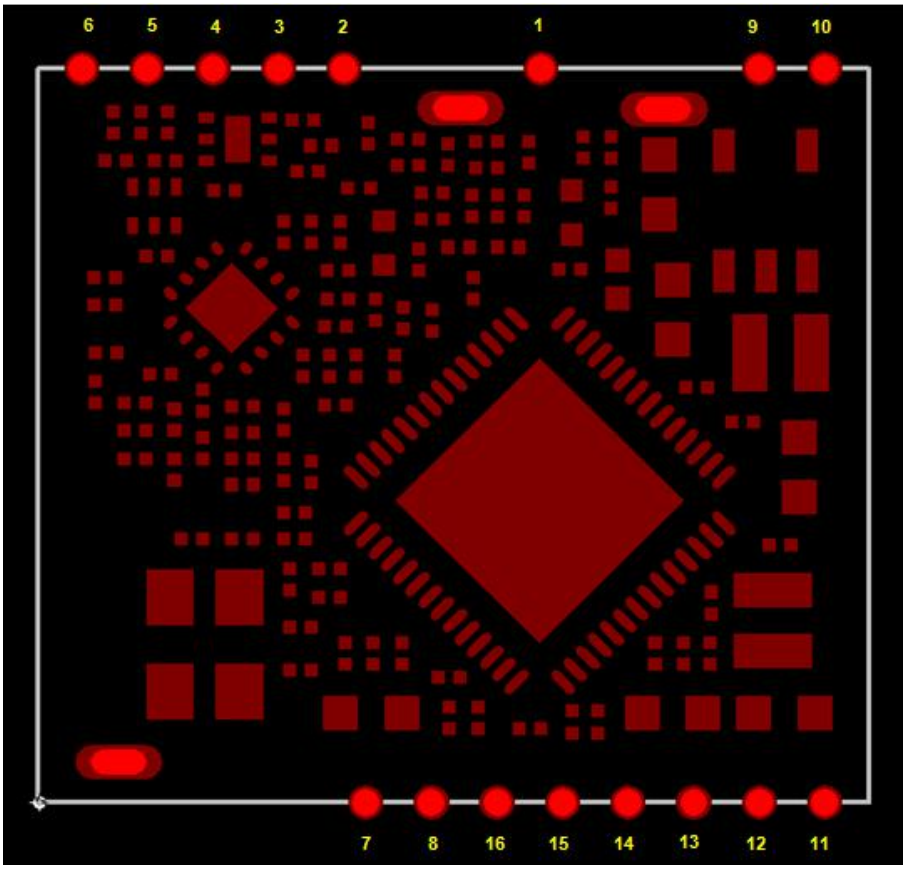
4.3 Module Dimension

<Top View>



4.4 Pin Definition

<Top View>

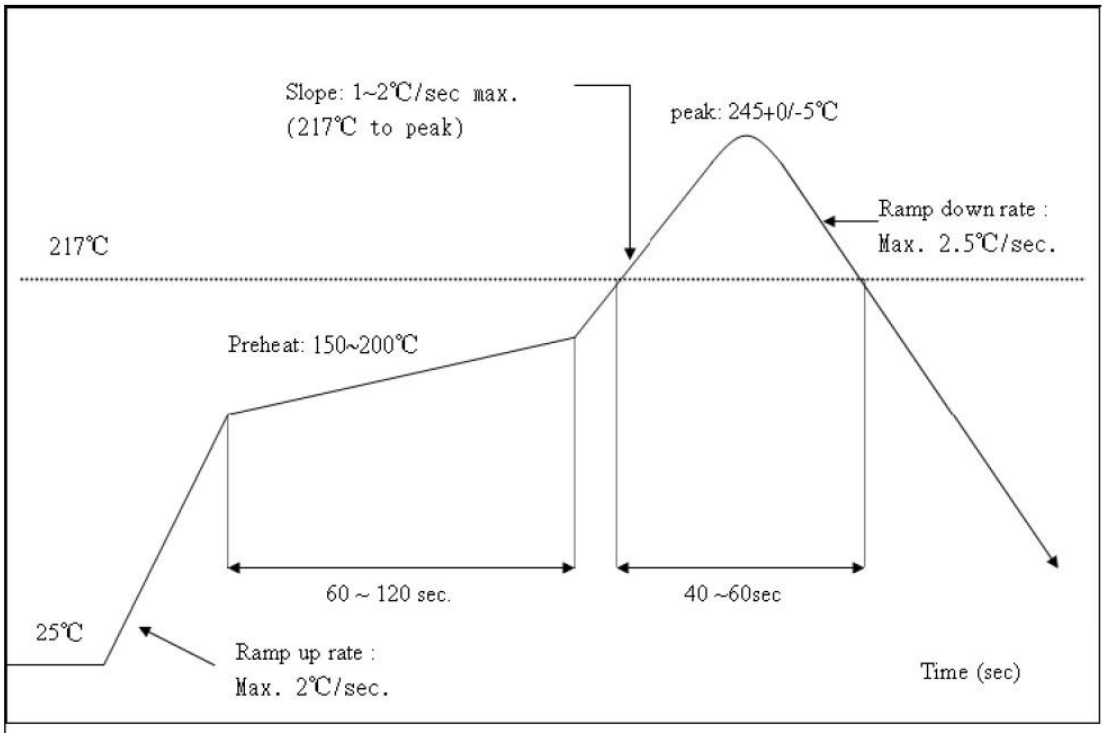


Pin #	Name	Description
1	LED0	LED Pin
2,4,6,10,13	GND	Ground
3	RF0	Main antenna
5	RF1	AUX Antenna
7	BT_DIS_N	Force BT function entering Radio-Off mode(active low)
8	WLAN_DIS_N	Force WLAN function entering Radio-Off mode(active low)
9	VDD	3.3V Input
11	DM	USB-
12	DP	USB+
14	PDN	Power down chip(active low)
15	CHIP_WAKE_HOST	Chip wakes up host
16	HOST_WAKE_CHIP	Host wakes up chip

5. Environmental Requirements

5.1 Recommended Reflow Profile

Referred to IPC/JEDEC standard.
Peak Temperature : <250°C
Number of Times : ≤2 times



5.2 Patch WIFI modules installed before the notice:

WIFI module installed note:

1. Please press 1 : 1 and then expand outward proportion to 0.7 mm, 0.12 mm thickness When open a stencil
2. Take and use the WIFI module, please insure the electrostatic protective measures.
3. Reflow soldering temperature should be according to the customer the main size of the products, such as the temperature set at 250 + 5 ℃ for the MID motherboard.

About the module packaging, storage and use of matters needing attention are as follows:

1. The module of the reel and storage life of vacuum packing: 1). Shelf life: 8 months, storage environment conditions: temperature in: < 40 ℃, relative humidity: < 90% r.h.
2. The module vacuum packing once opened, time limit of the assembly:
1) check the humidity display value should be less than 30% (in blue), such as: 30% ~ 40% (pink), or greater than 40% (red) the module have been moisture absorption.
2) factory environmental temperature humidity control: ≦ 30% ℃, ≦ 60% r.h..
3) Once opened, the workshop the preservation of life for 168 hours.
3. Once opened, such as when not used up within 168 hours:
1) The module must be again to remove the module moisture absorption.
2) The baking temperature: 125 ℃, 8 hours.
3) After baking, put the right amount of desiccant to seal packages.

6. Package

TBD.