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Product Specification

IEEE 802.11 a/b/g/n 2.4GHz/5GHz 2T2R Dual-band Wi-Fi Module

Project Name	**AR1021X 11 a/b/g/n 2T2R USB WIFI Module**
Model NO	**F1021UM13-W1 (External antenna)**
Customer	
Customer's Part NO	

Approved: Sunny LIU	Check: William TAN	Drafted: SJ LI

Feedback of customer's Confirmation

We accept the specification after Confirmed.

Customer	Customer signature	Approved Date

CONTENTS

0. Revision History

REV NO	Date	Modifications	Draft
Rev0.1	2014-7-23	First Released	SJ LI
Rev0.2	2014-11-14	Update USB interface, 2T2R, data rate up to 300Mbps	Neal Yu

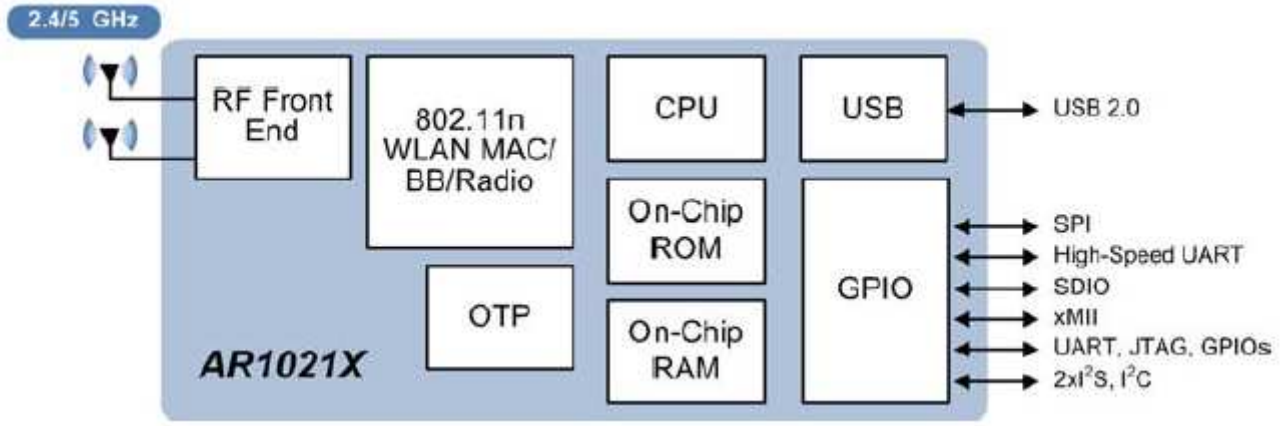
1. Introduction

1.1 Overview

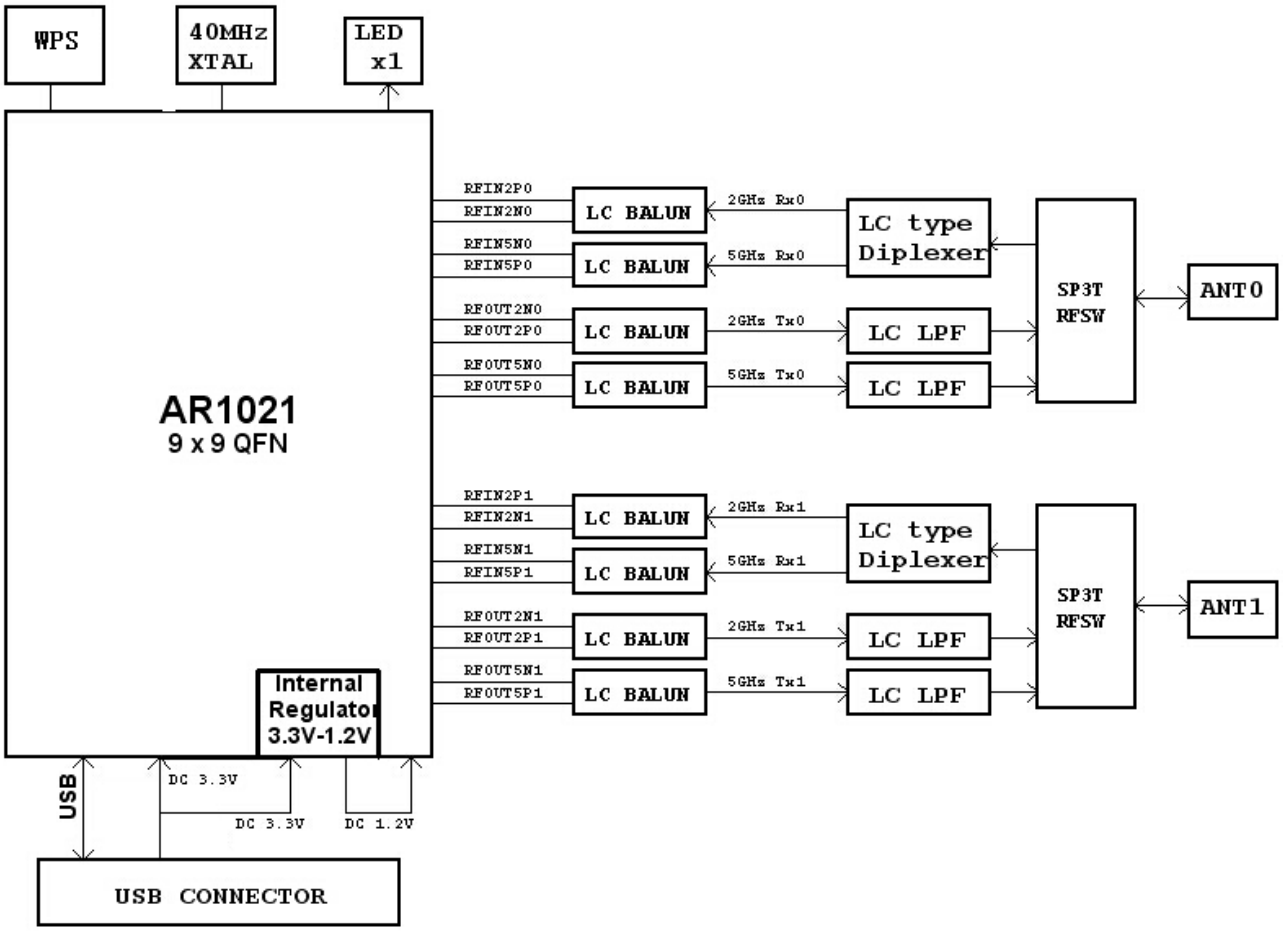
The AR1021X is a single chip 2x2 802.11a/b/g/n MIMO solution optimized for low-power embedded applications with dual-stream capability for both transmit and receive. Frame aggregation, reduced inter-frame spacing (RIFS), and half guard intervals provide improved throughput on the link. The AR1021X provides a robust communication solution, supporting maximal ratio combining (MRC), space-time block codes (STBC), and low density parity check (LDPC) codes. Additional performance optimization, such as 802.11n frame aggregation (AMPDU and A-MSDU) is supported, as well as low-overhead host assisted buffering for reception of both A-MSDU and A-MPDU aggregates. The SDIO driver also provides SDIO bus transaction bundling for reduced overhead.

These techniques can improve the performance and efficiency of applications involving large bulk data transfers (for example, file transfers or high-resolution video streaming). The typical data path consists of the host interface, mailbox DMA, AHB, memory controller, MAC, BB, and radio. The CPU drives the control path via register and memory access. External interfaces include USB, SDIO or SPI slave, reference clock, and front-end components, as well as optional connections such as UART, SPI/I2C, GPIO, JTAG.

The “System Block Diagram” as below.



1.2 Product Block Diagram



1.3 Product Features

◆ All-CMOS IEEE 802.11a/b/g/n 2x2 single-chip
◆USB2.0 at 480 Mpbs, with LPM support, using an integrated controller and PHY
◆ Extensive hardware support for WLAN coexistence through LPC message passing
◆ Power and clock management for extended battery life
◆ Green-Tx power saving
◆ Low-power listen mode and radio retention for reduced receive power consumption and sleep current
◆ Support for transmit beam forming (TxBF)
◆ Integrated PA, LNA minimizing external component count
◆ Optional external PA, LNA support
◆Data rates of up to 54 Mbps for 802.11a/g and 144.4 for 802.11n HT20, 300 Mbps for HT40
◆ Advanced power management to minimize standby, sleep and active power
◆Security support for WEP, WPA, WPA2, WAPI, as well as WPS and protected managements frames
◆ Block ACK
◆ UART for console support
◆ JTAG-based processor debugging supported

2. GENERAL SPECIFICATION

2.1 WiFi RF Specifications

Features	Descriptions
Main Chipset	AR1021X
Frequency Range	2.4G: 2.412GHz～2.484GHz 5G:4.900GHz～5.925GHz
Operating Voltage	3.3Vdc ±10% supply voltage
Host Interface	**WiFi:** USB
Standards	**WiFi:** IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n,
Modulation	**WiFi:** 802.11b: CCK(11, 5.5Mbps), QPSK(2Mbps), BPSK(1Mbps), 802.11 a/g/n: OFDM
PHY Data rates	**WiFi:** 802.11b: 11,5.5,2,1 Mbps 802.11a/g: 54,48,36,24,18,12,9,6 Mbps 802.11n: 150Mbps, 2T2R up to 300Mbps
Transmit Output Power	**WiFi:** 802.11b@ 1Mbps 16**±2**dBm 802.11b@11Mbps 16**±2**dBm 802.11g@6Mbps 16**±2**dBm 802.11g@54Mbps 14**±2**dBm 802.11n@65Mbps 16**±2**dBm (MCS 0_HT20) 14**±2**dBm (MCS 7_HT20) 16**±2**dBm (MCS 0_HT40) 14**±2**dBm (MCS 7_HT40) 802.11a@6Mbps 15**±2**dBm 802.11a@54Mbps 13**±2**dBm
EVM	802.11b /11Mbps : EVM≦-9dB 802.11a/g /54Mbps : EVM≦-25dB 802.11n /MCS 7 : EVM≦-28dB
Receiver Sensitivity (HT 20)	**802.11b@8% PER** 1Mbps -90±1dBm 2Mbps -88±1dBm 5.5Mbps -86±1dBm 11Mbps -84±1dBm
	802.11g@10% PER

	6Mbps -86±1dBm 9Mbps -85±1dBm 12Mbps -84±1dBm 18Mbps -82±1dBm 24Mbps -80±1dBm 36Mbps -77±1dBm 48Mbps -73±1dBm 54Mbps -71±1dBm
	802.11n@10% PER MCS 0 -83±1dBm MCS 1 -82±1dBm MCS 2 -80±1dBm MCS 3 -78±1dBm MCS 4 -75±1dBm MCS 5 -71±1dBm MCS 6 -69±1dBm MCS 7 -67±1dBm
	802.11a@10% PER 6Mbps -86±1dBm 9Mbps -85±1dBm 12Mbps -84±1dBm 18Mbps -82±1dBm 24Mbps -80±1dBm 36Mbps -77±1dBm 48Mbps -73±1dBm 54Mbps -71±1dBm
Receiver Sensitivity Bandwidth: 40MHz	**802.11a@10% PER** MCS 0 ≤-82±1dBm MCS 1 ≤-81±1dBm MCS 2 ≤-79±1dBm MCS 3 ≤-77±1dBm MCS 4 ≤-74±1dBm MCS 5 ≤-70±1dBm MCS 6 ≤-68±1dBm MCS 7 ≤-66±1dBm
Operating Channel	**WiFi 2.4GHz:** 11: (Ch. 1-11) – United States(North America) 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan
Media Access Control	**WiFi:** CSMA/CA with ACK
Network Architecture	**WiFi:** Ad-hoc mode (Peer-to-Peer) Infrastructure mode Software AP WiFi Direct
Security	**WiFi:** WPS, WPA2, WPA, WAP
Antenna	External antenna
Dimension	Typical L27.0*W20.0*T2.5mm

2.2 Sleep State Management

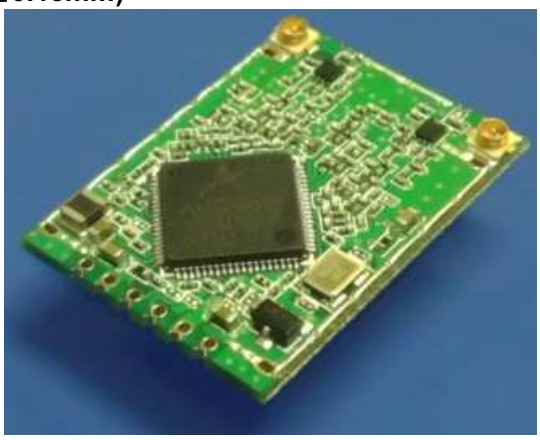
State	Descriptions
OFF	CHIP_PWD_L pin assertion immediately brings the chip to this state.
	Sleep clock is disabled.
	No state is preserved.
SLEEP	Only the sleep clock is operating.
	The crystal or oscillator is disabled.
	Any wakeup events (MAC, host, LF timer, GPIO interrupt) force a transition to WAKEUP.
	All internal states are maintained.
	Host interface is idle (USB is in SUSPEND)
WAKEUP	The system transitions from sleep/OFF states to ON.
	The high frequency clock is gated off as the oscillator is brought up and the PLL is enabled.
	WAKEUP duration is usually 2 ms.
ON	The high speed clock is operational and sent to each block enabled by the clock control register.
	Lower-level clock gating is implemented at the block level, including the CPU, which can be gated off using WAITI instructions while the system is on. No CPU, host, or WLAN activities go to sleep.

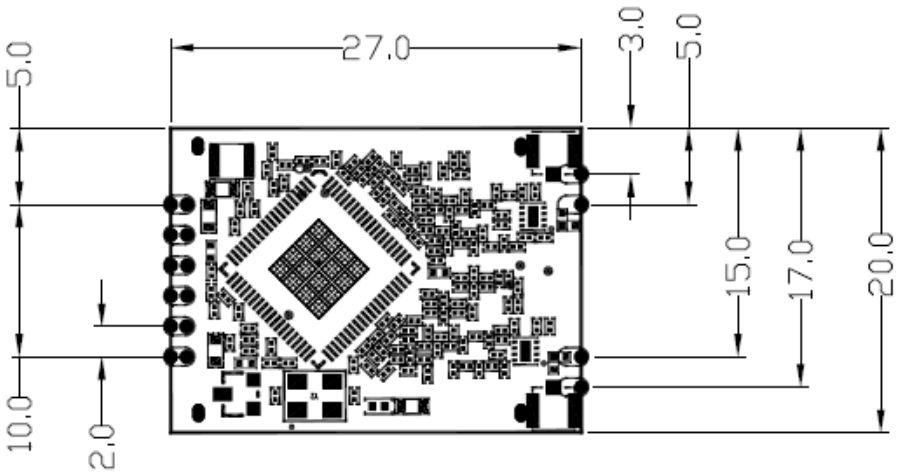
2.3 Power Consumption (unit: mA)

STATUS			Power Consumption
Power ON (Standby)			135
TX POWER	HT20	11n MCS0 TX	260
		11n MCS7 TX	240
		11g 6M TX	260
		11g 54M TX	240
		11b CCK1M TX	290
		11b CCK11M TX	280
	HT40	11n MCS0 TX	260
		11n MCS7 TX	240
	11g 6M TX		440
	11g 54M TX		400
RX POWER			140
SLEEP			1.0

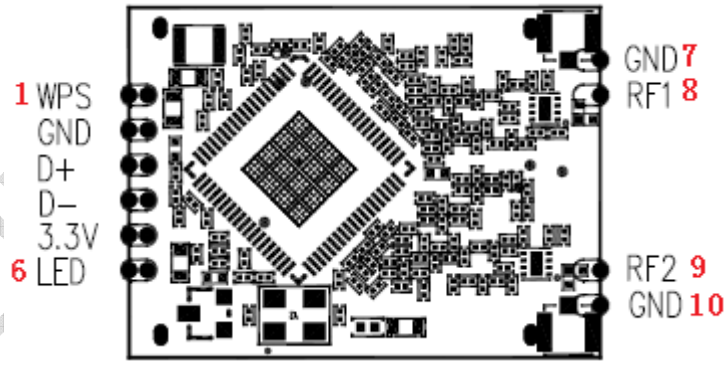
3. Mechanical Specification

3.1 Outline Drawing (Unit: ±0.15mm)





3.2 PIN Assignment



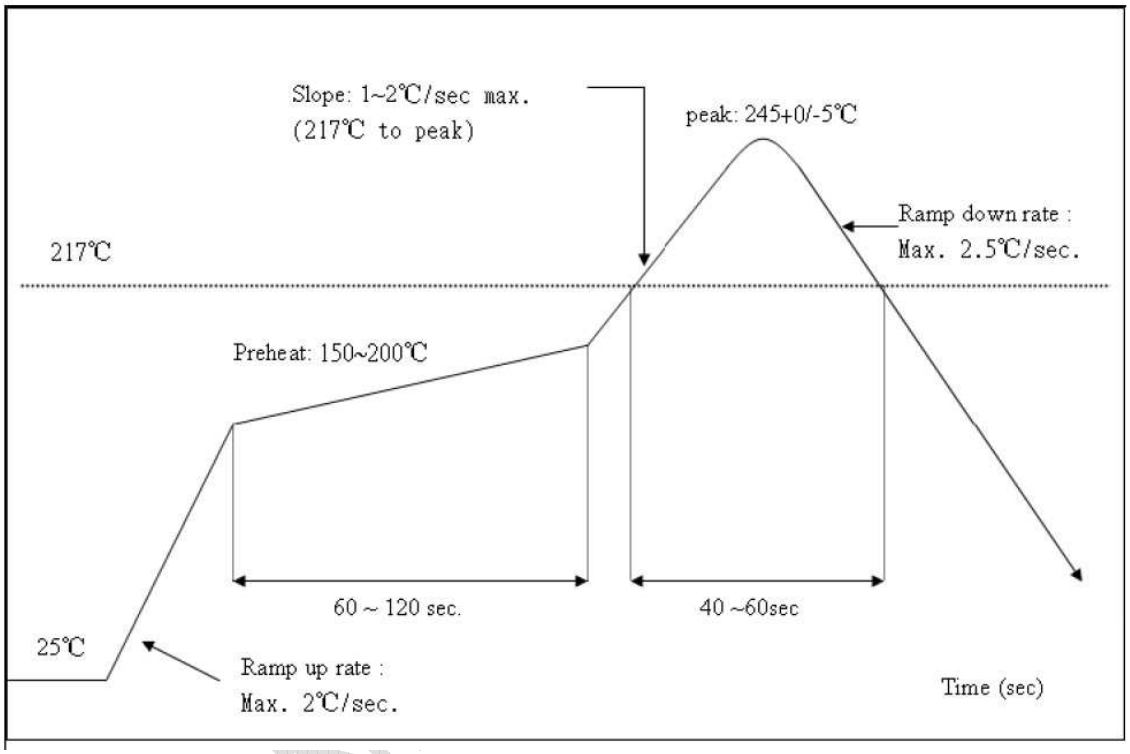
Pin #	Name	Description
1	WPS	WPS Switch (high potential)
2	GND	Ground
3	D+	USB Data +
4	D-	USB Data -
5	3.3V	3.3V Power Supply
6	LED	External LED control
7	GND	Ground
8	RF1	ANT1 OUT
9	GND	Ground
10	RF2	ANT2 OUT

4. Environmental Requirements

4.1 Operating& Storage Conditions

Operating	Temperature: 0°C to +55°C
	Relative Humidity: 10-90% (non-condensing)
Storage	Temperature: -40°C to +80°C (non-operating)
	Relative Humidity: 5-90% (non-condensing)

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



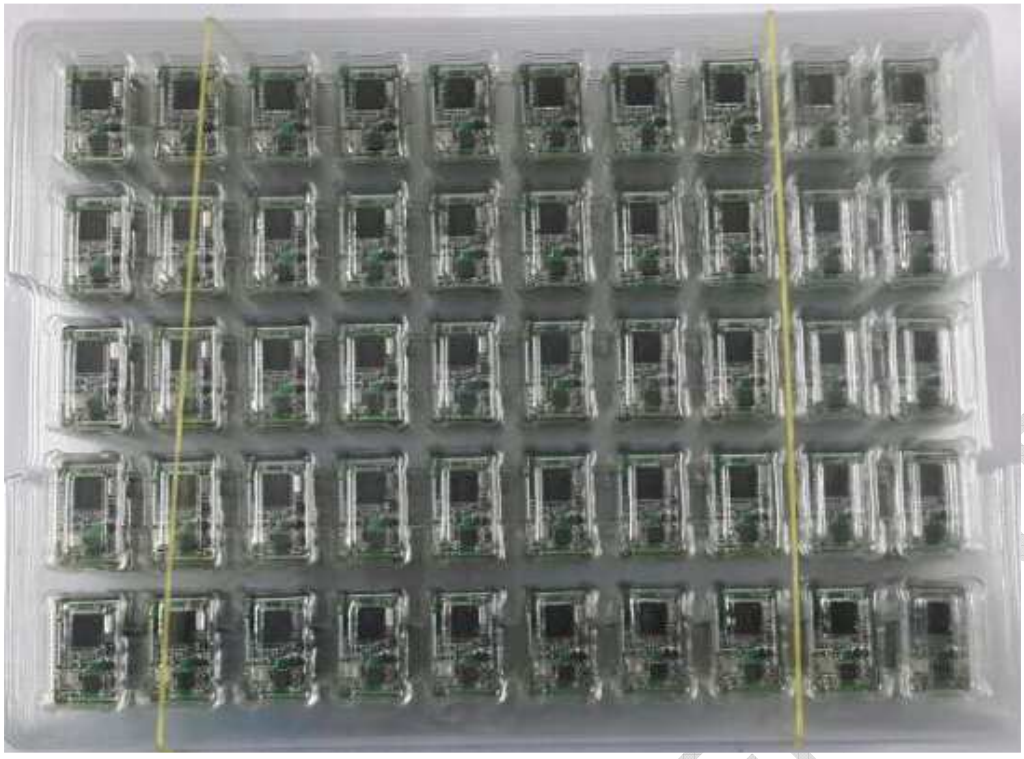
4.3 Patch WIFI modules installed before the notice:

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:
Card: 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.

5. PACKING INFORMATION

5.1 Blister packaging



Vacuum packaging

A piece of 50 PCS (500 pcs/bag)

THE END