USER MANUAL

(FOR INTEGRATION)

IEEE 802.11 a/b/g/n 2T/2R Dual Band USB Module Integrated Bluetooth 2.1/3.0/4.0LE

Model Number: WT31M2311A/A1/A2/A3

(MediaTek：MT7632TUN)

客户认可 Custom Approval Section		
Custom Name		
Department		
Approval		Date：

拟制 DESIGN	审核 CHECK	批准 APPROVAL
		

Document revision history

Revision	Date	Approved by	Remarks
Version 1.0	2016-10-20		Draft

1. General Description

This document is to specify the product requirements for 802.11a/b/g/n and BT combo module. This module is based on MediaTek MT7632TUN single chip that complied with IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11a standard from 2.4~2.5GHz and 5.15GHz ~ 5.35GHz , and it can be used to provide up to 11Mbps for IEEE 802.11b, 54Mbps for IEEE 802.11g, 300Mbps for 802.11n . The module complied with Bluetooth 2.1 with EDR, v3.0, and v4.0 with BLE.

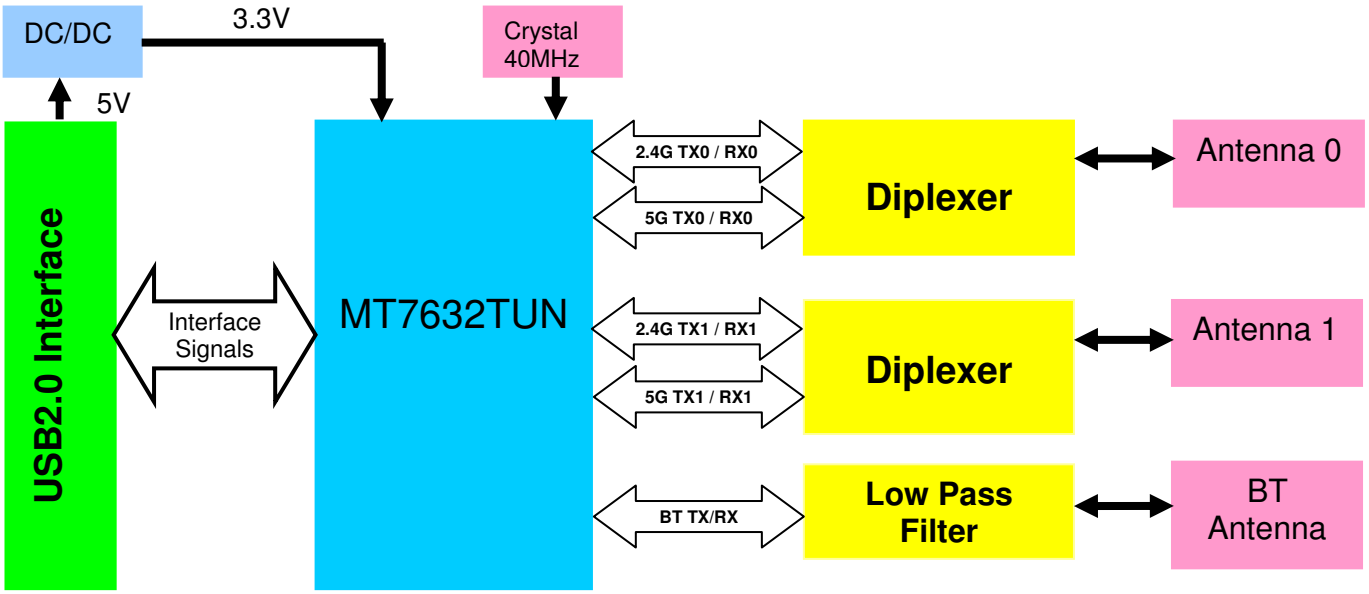
With seamless roaming, fully interoperability and advanced security with WEP standard, 802.11a/b/g/n combo module offers absolute interoperability with different vendors' 802.11b, 802.11g, and 802.11n Access Points through the wireless LAN.

2. Features

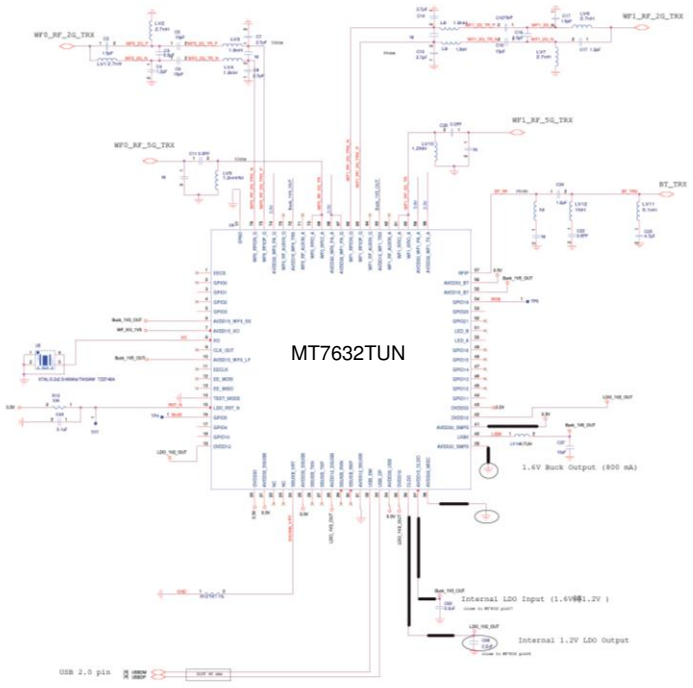
- Compatible with IEEE 802.11a standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11n standard to provide wireless 300Mbps data rate
- Operation at 2.4~2.5GHz and 5.15~5.825GHz frequency band to meet worldwide regulations
- Compatible with Bluetooth 2.1 with EDR, v3.0 and v4.0 with BLE.
- Maximum reliability, throughput and connectivity with automatic data rate switching
- Supports infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- High speed USB 2.0 interface
- RoHS compliant

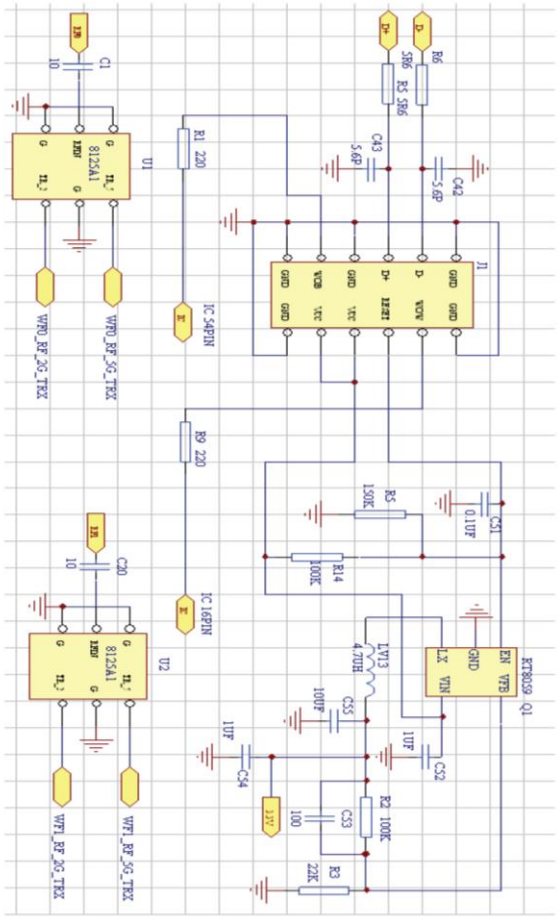
3. Application Diagrams

3.1 Functional Block Diagram



3.2 Schematic





3.3 General Requirements

3.3.1 IEEE 802.11b Section

#	Feature	Detailed Description
3.3.1.1	Standard	● IEEE 802.11b
3.3.1.2	Radio and Modulation Schemes	● CCK（DQPSK , DBPSK , DSSS）
3.3.1.3	Operating Frequency	● 2400 ～ 2483.5 MHz ISM band
3.3.1.4	Channel Numbers	● 11 channels for United States ● 13 channels for Europe Countries ● 14 channels for Japan
3.3.1.5	Data Rate	● 11,5.5,2,and 1Mbps
3.3.1.6	Media Access Protocol	● CSMA/CA with ACK
3.3.1.7	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain,Data Rate and at room Temp. 25degree C ● 17±1.5 dBm at 1,2,5.5,11Mbps
3.3.1.8	Receiver Sensitivity at Antenna Connector	● Typical Sensitivity at Which Frame(1000-byte PDUs)Error Rate=8% ● -90 dBm at 1Mbps ● -86 dBm for 11Mbps

3.3.2 IEEE 802.11g Section

#	Feature	Detailed Description
3.3.2.1	Standard	● IEEE 802.11g
3.3.2.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM with OFDM
3.3.3.3	Operating Frequency	● 2400 ～ 2483.5MHz ISM band
3.3.3.4	Channel Numbers	● 11 channels for United States ● 13 channels for Europe Countries ● 13 channels for Japan
3.3.2.5	Data Rate	● 6,9,12,18,24,36,48,54Mbps
3.3.2.6	Media Access Protocol	● CSMA/CA with ACK
3.3.2.7	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain,Data Rate and at roomTemp. 25degree C ● 16±1.5 dBm at 6,9Mbps ● 16±1.5 dBm at 12,18Mbps ● 15±1.5 dBm at 24,36Mbps ● 15±1.5 dBm at 48,54Mbps
3.3.2.8	Receiver Sensitivity at Antenna Connector	● Typical Sensitivity at each RF chain. Frame(1000-byte PDUs)Error Rate<10% at room Temp 25 degree C ● -92 dBm at 6Mbps ● -90 dBm at 9Mbps ● -88 dBm at 12Mbps ● -86 dBm at 18Mbps ● -82 dBm at 24Mbps ● -80 dBm at 36Mbps ● -76 dBm at 48Mbps ● -75 dBm at 54Mbps

3.3.3 IEEE 802.11a Section

#	Feature	Detailed Description
3.3.3.1	Standard	● IEEE 802.11a
3.3.3.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM with OFDM
3.3.3.3	Operating Frequency	● 5.15~5.35GHz、5.47~5.825GHz for US and Canada ● 5.15~5.35GHz and 5.47~5.725GHz for Japan ● 5.15~5.35GHz and 5.47~5.725GHz for Europe ● 5.15~5.35GHz and 5.725~5.825GHz for China
3.3.3.4	Channel Numbers	● 21 non-overlapping channels for US and Canada ● 8 non-overlapping channels for Japan ● 19 non-overlapping channels for Europe ● 16 non-overlapping channels for China
3.3.3.5	Data Rate	● 6,9,12,18,24,36,48,54Mbps
3.3.3.6	Media Access Protocol	● CSMA/CA with ACK
3.3.3.7	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain,Data Rate and at roomTemp. 25degree C ● 16±1.5dBm at 6,9Mbps ● 16±1.5dBm m at 12,18Mbps ● 15±1.5dBm at 24,36Mbps ● 15±1.5dBm at 48,54Mbps
3.3.3.8	Receiver Sensitivity at Antenna Connector	● Typical Sensitivity at each RF chain. Frame(1000-byte PDUs)Error Rate<10% at room Temp 25 degree C ● -90 dBm at 6Mbps ● -88 dBm at 9Mbps ● -87 dBm at 12Mbps ● -85 dBm at 18Mbps ● -82 dBm at 24Mbps ● -80 dBm at 36Mbps ● -75 dBm at 48Mbps ● -73 dBm at 54Mbps

3.3.4 IEEE 802.11n Section

#	Feature	Detailed Description
3.3.4.1	Standard	• IEEE 802.11n
3.3.4.2	Radio and Modulation Type	• BPSK , QPSK , 16QAM ,64QAM with OFDM
3.3.4.3	Operating Frequency	• 2.4GHz band:2400 ~ 2483.5MHz ISM band • 5GHz and:5150 ~ 5825MHZ
3.3.4.4	Data Rate	

MCS	GI=800ns		GI=400ns	
	20MHz	40MH	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
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

3.3.4.5	Media Access Protocol	● CSMA/CA with ACK	
3.3.4.6	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain,Data Rate and at roomTemp. 25 degree C	
		● 2.4GHz Band/HT20 15~14±1.5 dBm at MCS0~7 14±1.5 dBm at MCS8~15	● 2.4GHz Band/HT40 15~14±1.5 dBm at MCS0~7 14±1.5 dBm at MCS8~15
		● 5GHz Band/HT20 15~14±1.5 dBm at MCS0~7 14±1.5 dBm at MCS8~15	● 5GHz Band/HT40 15~14±1.5 dBm at MCS0~7 14±1.5 dBm at MCS8~15
3.3.4.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain at Which Frame (1000-byte PDUs) Error Rate=10% and at room Temp.25 degree.	
		2.4GHz Band/HT20 ● -90dBm at MCS0/8 ● -87dBm at MCS1/9 ● -85dBm at MCS2/10 ● -82dBm at MCS3/11 ● -78dBm at MCS4/12 ● -76dBm at MCS5/13 ● -75dBm at MCS6/14 ● -74dBm at MCS7/15	2.4GHz Band/HT40 ● -89dBm at MCS0/8 ● -86dBm at MCS1/9 ● -84dBm at MCS2/10 ● -81dBm at MCS3/11 ● -77dBm at MCS4/12 ● -73dBm at MCS5/13 ● -72dBm at MCS6/14 ● -71dBm at MCS7/15
		5GHz Band/HT20 ● -90dBm at MCS0/8 ● -87dBm at MCS1/9 ● -85dBm at MCS2/10 ● -82dBm at MCS3/11 ● -78dBm at MCS4/12 ● -74dBm at MCS5/13 ● -73dBm at MCS6/14 ● -72dBm at MCS7/15	5GHz Band/HT40 ● -87dBm at MCS0/8 ● -84dBm at MCS1/9 ● -82dBm at MCS2/10 ● -79dBm at MCS3/11 ● -75dBm at MCS4/12 ● -72dBm at MCS5/13 ● -70dBm at MCS6/14 ● -68dBm at MCS7/15

3.3.5 Bluetooth Section

#	Feature	Detailed Description
3.3.5.1	Radio and Modulation Schemes	• FHSS,GFSK,DPSK,DQPSK
3.3.5.2	Operating Frequency	• 2402 ～ 2480 MHz in the ISM band
3.3.5.3	Channel Numbers	• 79 channels
3.3.5.4	Symbol Rate	• 1、2 and 3 Mbps
3.3.5.5	Carrier Spacing	• 1.0MHZ
3.3.5.6	Antenna reference	• Small antenna with 0-2 dbi peak gain
3.3.5.7	Transmitter Output Power at Antenna Connector	• Typical RF Output Power (tolerance +/-1.5dB) at each RF chain, Data Rate and at room Temp. 25degree C • -6≤Output Power≤+10 dBm ;CLASS 1.5 Device

		Note: The maximum power setting will vary according to individual country regulations.
3.3.5.8	Receiver Sensitivity at Antenna Connector	• Sensitivity @ BER=0.1% for GFSK (1Mbps) Typical: -86dBm
		• Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps) Typical:-86dBm
		• Sensitivity @ BER=0.01% for 8DPSK (3Mbps) Typical:-80dBm
3.3.5.9	Sensitive @BER=0.01% FOR 8DQPSK(3Mbps) Maximum input level	• GFSK(1Mbps) -20dBm
		• π/4-DQPSK(2Mbps) -20dBm
		• 8DQPSK(3Mbps) -20dBm
3.3.5.9	Carrier Frequency Stablity	• DH1: ±25 kHz
		• DH3/DH5: ±40 kHz

4. Thermal and Electrical Characteristics

4.1 Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-40	+80	℃
Storage Relative Humidity	5-95%(non-condensing)		
Ambient Operating Temperature	0	+60	℃
Operating Relative Humidity	5-90%(non-condensing)		
Junction Temperature	0	+125	℃

4.2 General Section

#	Feature	Detailed Description
4.2.1	Antenna Type	● PIFA antenna (WiFi) (see appendix1) ● I-PEX connector (BT) (see appendix2) ● PIFA antenna (BT) (see appendix3)
4.2.2	Operating Voltage	● 5.0V±10%
4.2.3	Current Consumption	● 900 mA at continuous transmit mode ● 360 mA at receive mode w/o receiving packet
4.2.4	Form Factor and Interface	● High Speed USB2.0 Interface
4.2.5	Connector	● 9 pin connector (see appendix4)

5. Software

5.1 DRIVER Information

Driver	Win7, Linux, MAC
Security	64/128-bits WEP, WPA, WPA2

5.2 EEPROM Information

BT

Vendor ID	0x0E8D

Product ID	0x76A1

WiFi

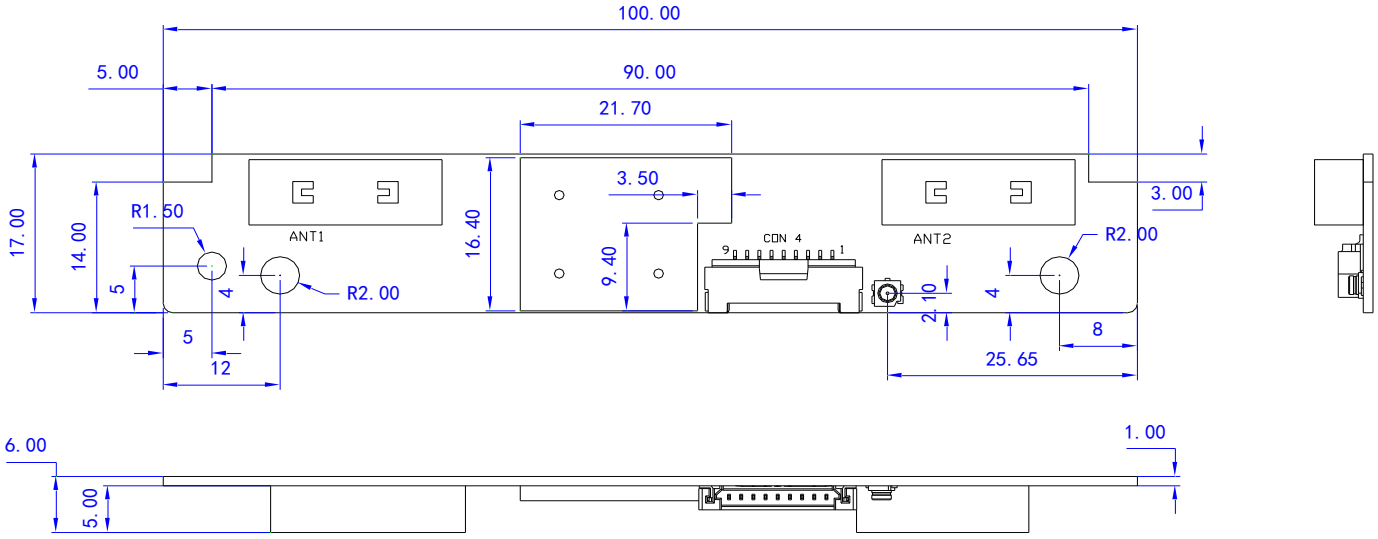
Reg Domain	Worldwide 2.4G/5G Read from registry；Control by driver
	Offset 0x38 for 5G:0xFF Offset 0x39 for 2.4G:0xFF
Vendor ID	0x0E8D
Product ID	0x76A1

6. Mechanical Characteristics

6.1 Mechanical Requirements

#	Feature	Detailed Description
6.1.1	Length	● 100mm
6.1.2	Width	● 17mm
6.1.3	Height	● 1.0mm(PCB) ● MAX：8mm

6.2 Mechanical Dimensions



尺寸误差范围：**零件尺寸详见附页**

Size error range: parts size as shown in the attachment

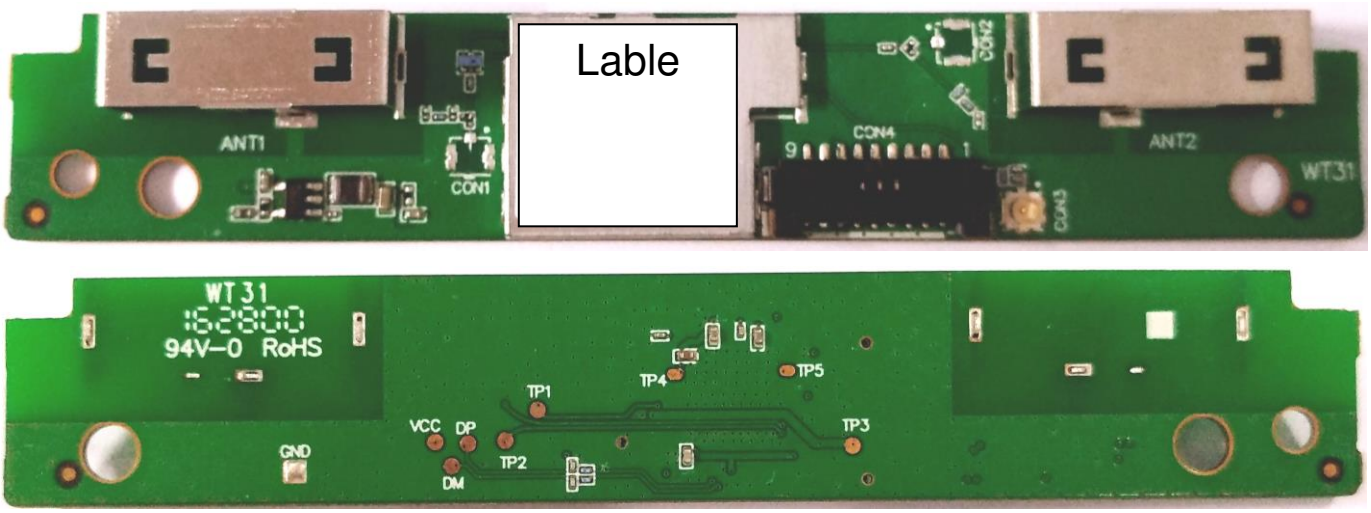
DIM(MM)	Tolerance(MM)
0-5	±0.15
5-10	±0.20
10-50	±0.30

6.3 Pin Description

1.25-9 Pin connector

Pin	1	2	3	4	5	6	7	8	9
Definition	VCC	DM	DP	GND	WiFi_ Reset	WiFi_I RQn	WiFi_I RQn	GND	VCC
	5V	USB D-	USB D+			WOLAN	WOBT		5V

6.4 Product Pictiure



6.5 Power consumption

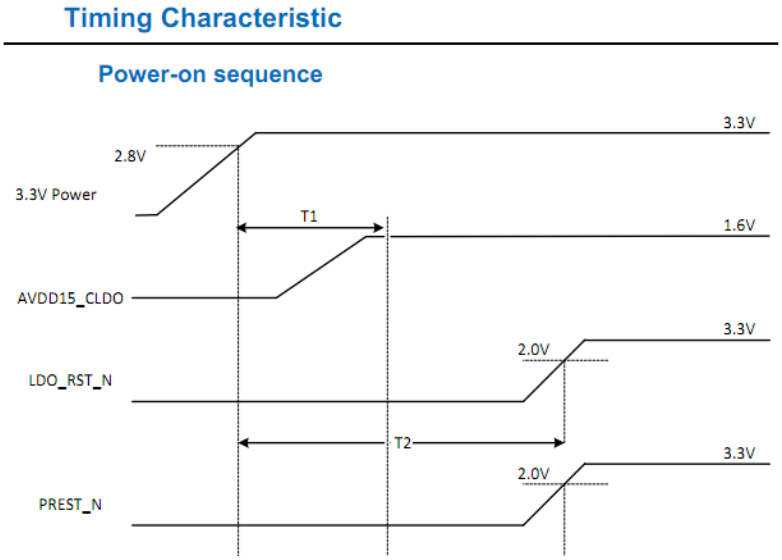
	mode			正常使用 MAX 值 Normal use MAX value		瞬间启动 MAX 值 Instant on MAX value	
				2.4G	5G	2.4G	5G
Power consumption	正常使用（联网跑传输率）Normal use (network run rate)	WiFi	TX	470mA	570mA	700mA	940mA
			RX	150mA	160mA	250mA	260mA
		BT		160mA		200mA	
	Idle Mode （联网不跑传输率）Don't run rate (networking)			160mA			

Remarks: Strongly recommend TV platform has to fulfill output current at least 1A

测试方法：使用MTK Tools，版本号V1.0.3.0，打出Module 所设定的最大功率，量测耗电量。

Test method: using the MTK Tools, version number V1.0.3.0, hit the Module maximum power set, the measured power consumption.

6.6 Power on sequence timing



T1:max 1ms

T2:＞1ms

7. BOM(Part List)

关键件清单Key-module listing

序号 number	位号no.	名称name	数量 PCS	商标/制造商 trademark/manufacturers	使用状态Using a state
1		集成电路integrated circuit	1	MTK	在用In the use
2		WiFi天线WiFi antenna	2	----	在用In the use
3		印制板PCB	1	----	在用In the use
4		贴片电容器patch capacitor	57	----	在用In the use
5		贴片电感器patch capacitor	19	----	在用In the use
6		贴片电阻器SMD resistor	9	----	在用In the use
7		贴片插座(镀金) SMT socket (plating)	1	----	在用In the use
8		晶体振荡器Crystal oscillator	1	----	在用In the use
9		BT天线BT antenna	1	----	在用In the use

FCC Statement

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.

To assure continued compliance, any changes or modifications not expressly approved by the party.

Responsible for compliance could void the user's authority to operate this equipment. (Example- use only shielded interface cables when connecting to computer or peripheral devices).

This equipment 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.

FCC Radiation Exposure Statement:

The equipment complies with FCC Radiation exposure limits set forth for uncontrolled enviroment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

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FCC Important Notes:

(1)
FCC Statement
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter
must not be co-located or operating in conjunction with any other antenna or transmitter.
This equipment 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.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Modular could be only used in mobile or fix device, and could not be used in any portable device.

Caution!
The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user authority to operate the equipment.

FCC 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 and your body. This device and it's antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

(2)
Co-location Warning:
This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

(3)
OEM integration instructions:
This device is intended only for OEM integrators under the following conditions:
The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the integral antenna(s) that has been originally tested and certified with this module.
As long as 3 conditions above are met, further transmitter 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 (for example, digital device emissions, PC peripheral requirements, etc.).

(4)
Validity of using the module certification:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot 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.

(5)
End product labeling:
The final end product must be labeled in a visible area with the following:
"Contains Transmitter Module FCC ID: 2AC23-WT31M2311A".

(6)
Information that must be placed in the end user manual:
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.

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.

IEEE 802.11b or 802.11g operation of this product in the USA is firmware-limited to channels 1 through 11.
The device for the band 5150-5250 MHz is only for indoor usage to reduce the potential for harmful interference to co-channel mobile satellite systems.

IC Statement

- English: "
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."
The final end product must be labeled in a visible area with the following:

"Contains Transmitter Module IC: 12290A-WT31M2311A".

- French:"
Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

The final end product must be labeled in a visible area with the following:
"Contains Transmitter Module IC: 12290A-WT31M2311A".

Approved antennas (do not use any other antenna than listed below):

For Wi-Fi, onboard PIFA Antenna 1:
Max. Gain: 2400-2483.5: 3 dBi
Max. Gain: 5150~5250, 5725~5850: 2.54 dBi
External Antenna 1: none

For Wi-Fi, onboard PIFA Antenna 2
Gain: 2400-2483.5: 3 dBi
Max. Gain: 5150~5250, 5725~5850: 3.91 dBi
External Antenna 2: none

For Bluetooth (BT, BLE), external PIFA Antenna:
Max Gain: Gain: 3 dBi