保密等级：机密

SPECIFICATION

产品规格书

SKI.WI431.1

IEEE 802.11b/g/n 1T1R UART Wi-Fi IoT Module

Approved by Shikun		
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REVISION HISTORY

VERSION	DATE	BOARD ID	PAGE	DESCRIPTION	AUTHOR
V0	2019.06.21	SKI.WI431.1 A19195	All	First Issued.	Danny
V1	2020.06.01	SKI.WI431.1 A19195	All	Label add SRRC mark Update pin definition Update Reference Design	Danny

Content

1. Introduction（简介）

SKI.WI431.1 is a highly integrated Wi-Fi SoC product which supports the 802.11b/g/n protocol of IEEE,based on the ATBM6431 scheme of Gaotuo Info.

ATBM6431 provides customers with a set of IoT solutions with excellent performance and high stability. It integrates a low-power MCU processor. It can realize Wi-Fi network function independently. It has built-in 2 Mbytes (16 Mbits) SPI Flash memory and provides high-speed cache for embedded FreeRTOS system.

ATBM6431 supports all transmission rates of IEEE 802.11b, 802.11g and 802.11n, It provides a series of configurable GPIO ports that configure digital peripherals for different applications and controls.

To improve data throughput, the product also supports frame aggregation technologies such as A-MPDU, as well as power reduction technologies such as Legacy Power Save and U-APSD. This document describes the engineering requirements specification.

SKI.WI431.1 基于高拓讯达 ATBM6431 方案，是一款支持 IEEE 802.11b/g/n 协议的高集成度 Wi-Fi SoC 产品。

ATBM6431 为客户提供了一整套性能卓越、稳定性高的 IoT 解决方案，在其中集成了低功耗 MCU 处理器，可以独自实现 Wi-Fi 网络功能，内置 2 Mbytes(16 Mbits) SPI Flash 存储器，为嵌入式 FreeRTOS 系统提供高速缓存。

ATBM6431 支持 IEEE 802.11b、802.11g 和 802.11n 的所有传输速率，它提供一系列可配置的 GPIO 口，这些 GPIO 为不同应用程序和控制使用的数字外围设备进行配置。

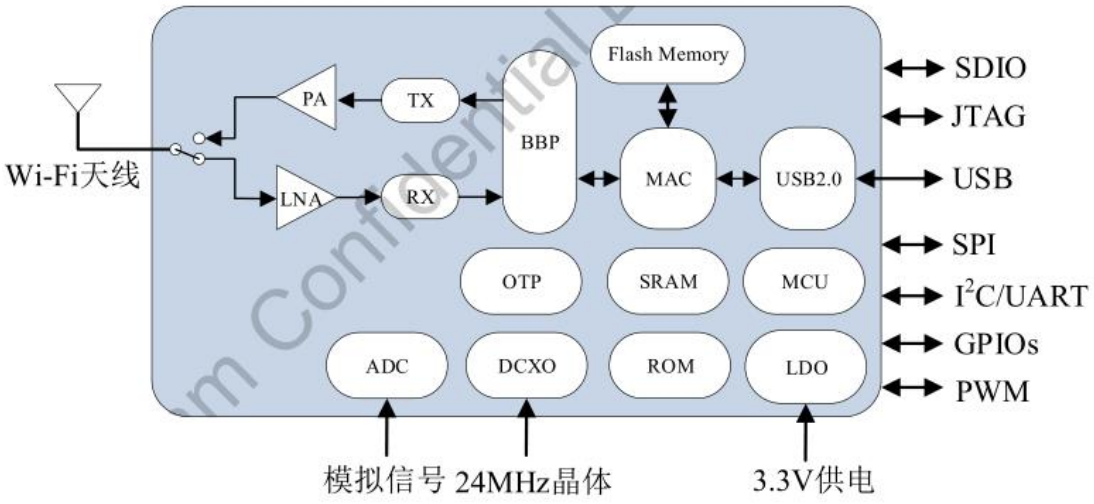
为提高数据吞吐率，该产品还支持如 A-MPDU 等帧聚合技术，同时支持 Legacy Power Save 和 U-APSD 等降低功耗的技术。本文件描述了工程需求规范。

2. Features（特性）

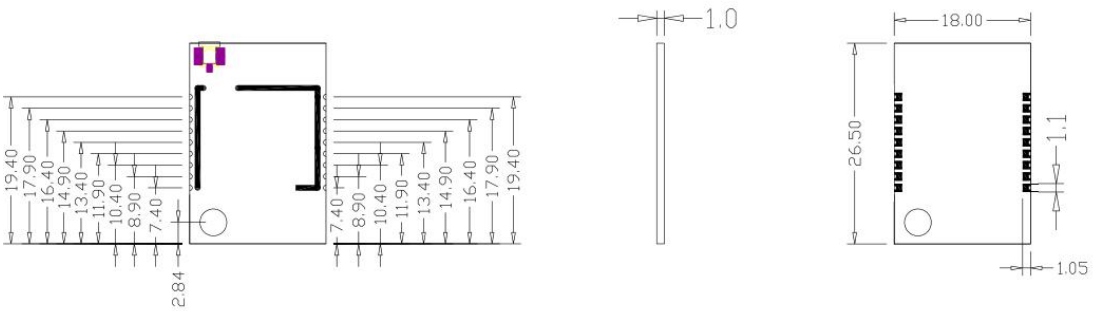
Reserving System **接收制式**	IEEE Std. 802.11b
	IEEE Std. 802.11g
	IEEE Std. 802.11n
Chip Solution **芯片方案**	ATBM6431
Band **波段**	2.4GHz
Dimensions **尺寸**	26.5mm×18.0mm×3.4mm

型号	安装方式	支持标准	频段	天线接口	备注
SKI.WI431.1	SMD	IEEE 802.11b/g/n	2.4GHz	PCB 天线	26.5mm×18.0mm×3.4mm

3. Block Diagram（结构框图）



4. Package Outline and Mounting（外形及安装尺寸）



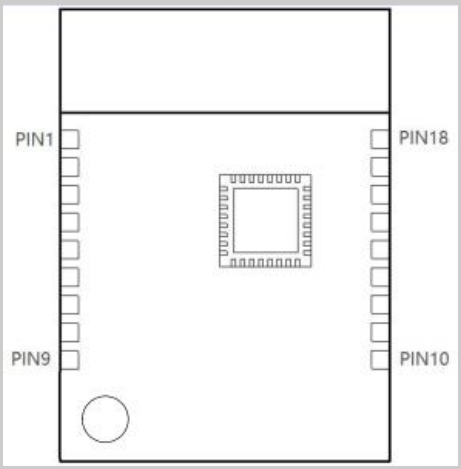
模组主视图　　模组侧视图　　模组后视图

注意：1单位为mm
2模组外形尺寸公差为0.2mm，板厚以及未标注公差为0.1mm

5. Pin Definition（引脚定义）

SKI.WI431.1 提供两种配置，分别为 3.3V 供电板贴形式和 5V 供电外挂形式，用户可以灵活选择类型装配到整机。

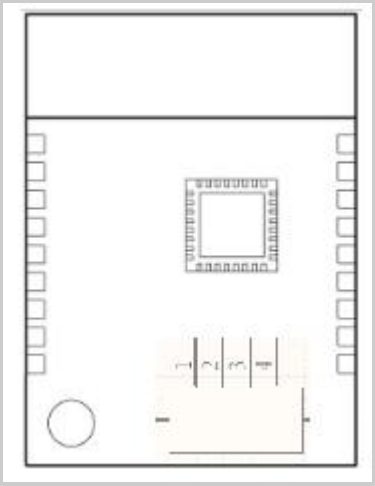
类型 1，板贴模组（3.3V 供电）



正视图

PIN	SYMBOL	DESCRIPTION
1	3V3	3.3V 供电
2	EN	芯片使能脚，正常使用时，模组默认悬空 (外部预留 10K 上拉到 3.3V)
3	RXD1	1 路串口 RX---与外部 MCU 通信
4	TXD1	1 路串口 TX---与外部 MCU 通信
5	IO13	GPIO
6	IO15	GPIO (模组外部需预留 10K 电阻下拉到 GND)
7	BooT_SEL	预留测试点即可，用于模组产测、手动更新固件
8	GPIO17	预留测试点即可，用于模组产测、手动更新固件
9	GND	接地脚
10	IO4	GPIO
11	RXD2	2 路串口 RX---Debug
12	TXD2	2 路串口 TX---Debug
13	GND	接地脚
14	IO5	GPIO
15	Reset	复位脚，主板预留测试点 (低电平有效，外部预留 10K 上拉到 3.3V)
16	TOUT	ADC 电压检测输入管脚
17	IO16	GPIO
18	GND	接地脚

类型 2，外挂模组（5V 供电）



正视图

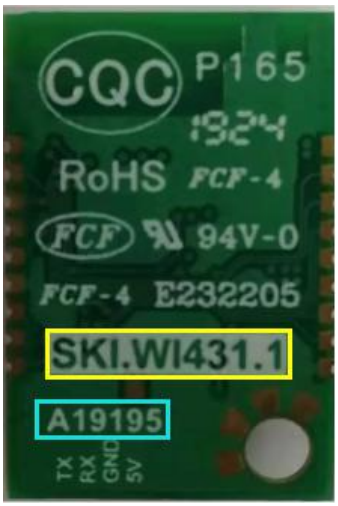
PIN	SYMBOL	DESCRIPTION
1	5V	3.3V 供电
2	GND	GND
3	RXD2	串口 RX2---与外部 MCU 通信，Debug
4	TXD2	串口 TX2---与外部 MCU 通信，Debug

6. Product Pictures（实物图片）

正视图 A（top view）

正视图 B（top view）

说明：SKI.WI431.1 有两种配置，图 A 对应类型 1，板贴模组（3.3V 供电），图 B 对应类型 2，外挂模组（5V 供电）



背视图（bottom view）

丝印说明：

（1）蓝色框内：A19195 为产品周期号

（2）黄色框内：SKI.WI431.1 为产品型号

（3）产品铭牌内容如下：

7. Key Materials（关键物料）

序号	关键件名称	型号	规格/材料	备注
1	集成电路	ATBM6431	QFN-40	
2	PCB	SKI.WI431.1	FR-4，4LAY	
3	晶体振荡器	2.3.3.240001234	24MHz	

8. General Requirements（一般要求）

No.	Feature	Description
8-1	Operation Voltage 工作电压范围	3.3V±0.3
8-2	Current Consumption 最大电流	600mA
8-3	Ripple 纹波	≤120mV
8-4	Operation Temperature 工作温度范围	0°C to +40°C
8-5	Antenna Type 天线类型	Internal antenna
8-6	Interface	UART Interface
8-7	Storage Temperature 存储温度	-15°C to +45°C

9. Electrical Characteristics（电气特性）

除非另有说明，电气规范试验都在下列条件下进行:

环境条件温度：25℃±5℃；

电源电压：模块输上入电压 3.3V（±10%）；

The Test for electrical specification was performed under the following condition unless otherwise specified.

Ambient condition Temperature :25℃ ± 5℃;

Power supply voltages：3.3V (±10%) input power at the Module;

9.1 IEEE 802.11b Section

Items	Contents				
Specification	IEEE802.11b				
Mode	CCK				
Channel	CH1 to CH13				
Data rate	1， 2， 5.5， 11Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels(Calibrated)					
17dBm Target (For Each antenna port) @ 11b/6Mbps~54Mbps	14.5	16.5	18.5	dBm	
2. Spectrum Mask @ target power					
1) fc ±11MHz to ±22MHz	-	-	-30	dBr	
2) fc > ±22MHz	-	-	-50	dBr	
3 Constellation Error(EVM)@ target power					
1) 1Mbps	-	-	-10	dB	
2) 2Mbps	-	-	-10	dB	
3) 5.5Mbps	-	-	-10	dB	
4) 11Mbps	-	-	-10	dB	
4. Frequency Error	-15	-	15	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5 Minimum Input Level Sensitivity (each chain)					
1) 1Mbps (FER ≦8%)	-	-	-83	dBm	
2) 2Mbps (FER ≦8%)	-	-	-80	dBm	
3) 5.5Mbps (FER ≦8%)	-	-	-79	dBm	
4) 11Mbps (FER ≦8%)	-	-	-76	dBm	
6 Maximum Input Level (FER ≦8%)	-10	-	-	dBm	

9.2 IEEE 802.11g Section

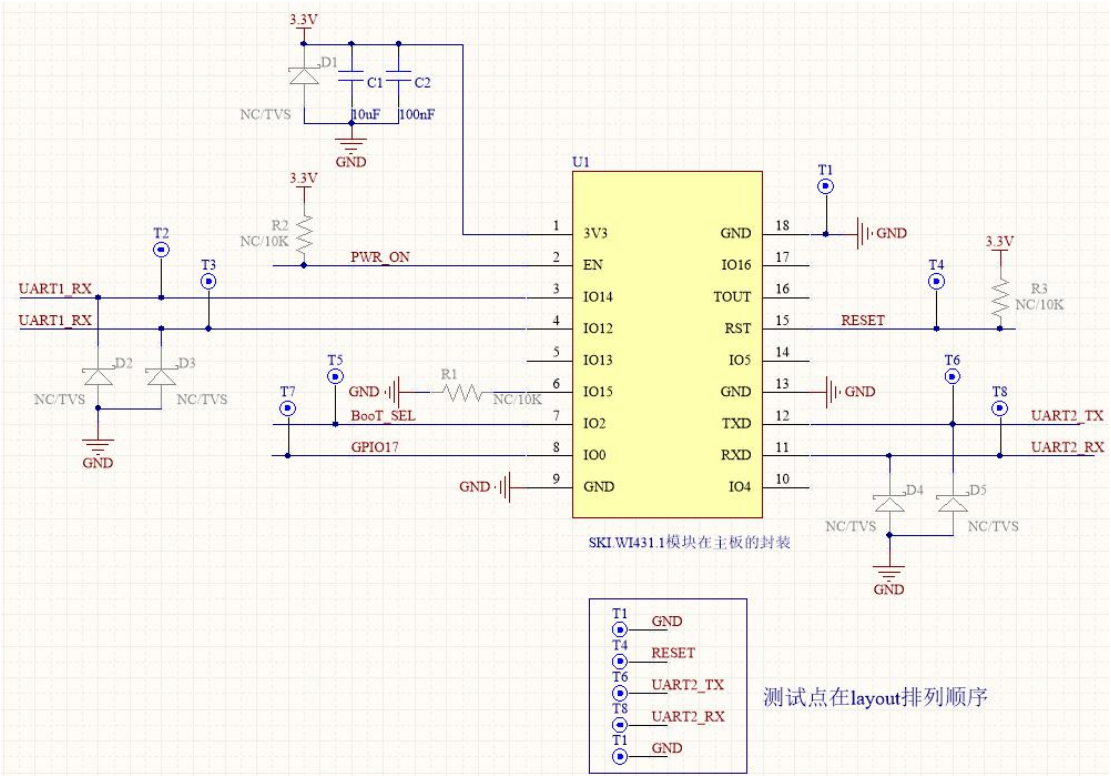
Items	Contents				
Specification	IEEE802.11g				
Mode	OFDM				
Channel	CH1 to CH13				
Data rate	6， 9， 12， 18， 24， 36， 48， 54Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
15dBm Target (For Each antenna port) @ 11g/6Mbps~54Mbps	13	15	17	dBm	
2. Spectrum Mask @ target power					
1) at fc ±11MHz	-	-	-20	dBr	
2) at fc ±20MHz	-	-	-28	dBr	
3) at fc > ±30MHz	-	-	-40	dBr	
3 Constellation Error(EVM)@ target power					
1) 6Mbps	-	-	-5	dB	
2) 9Mbps	-	-	-8	dB	
3) 12Mbps	-	-	-10	dB	
4) 18Mbps	-	-	-13	dB	
5) 24Mbps	-	-	-16	dB	
6) 36Mbps	-	-	-19	dB	
7) 48Mbps	-	-	-22	dB	
8) 54Mbps	-	-	-25	dB	
4 Frequency Error	-25	-	25	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5 Minimum Input Level Sensitivity (each chain)					
1) 6Mbps (PER ≦10%)	-	-	-85	dBm	
2) 9Mbps (PER ≦10%)	-	-	-84	dBm	
3) 12Mbps (PER ≦10%)	-	-	-82	dBm	
4) 18Mbps (PER ≦10%)	-	-	-80	dBm	
5) 24Mbps (PER ≦10%)	-	-	-77	dBm	
6) 36Mbps (PER ≦10%)	-	-	-73	dBm	
7) 48Mbps (PER ≦10%)	-	-	-69	dBm	
8) 54Mbps (PER ≦10%)	-	-	-65	dBm	
6 Maximum Input Level (PER ≦10%)	-20	-	-	dBm	

9.3 IEEE 802.11n HT20 Section(2.4GHz)

Items	Contents				
Specification	EEE802.11n HT20 @ 2.4GHz				
Mode	OFDM				
Channel	CH1 to CH13				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
2. Power Levels					
14dBm Target (For Each antenna port) @ 2.4G/MCS0~MCS7	12	14	16	dBm	
3. Spectrum Mask @ target power					
1) at fc ±11MHz	-	-	-20	dBr	
2) at fc ±20MHz	-	-	-28	dBr	
3) at fc > ±30MHz	-	-	-45	dBr	
4. Constellation Error(EVM)@ target power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-	-28	dB	
5. Frequency Error	-25	-	25	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
6. Minimum Input Level Sensitivity (each chain)					
1) MCS0 (PER ≦10%)	-	-	-82	dBm	
2) MCS1 (PER ≦10%)	-	-	-79	dBm	
3) MCS2 (PER ≦10%)	-	-	-77	dBm	
4) MCS3 (PER ≦10%)	-	-	-74	dBm	
5) MCS4 (PER ≦10%)	-	-	-70	dBm	
6) MCS5 (PER ≦10%)	-	-	-66	dBm	
7) MCS6 (PER ≦10%)	-	-	-65	dBm	
8) MCS7 (PER ≦10%)	-	-	-64	dBm	
7. Maximum Input Level (PER ≦10%)	-20	-	-	dBm	

10. Reference Design （参考设计）

针对类型 1，板贴模组（3.3V 供电）的主板设计参考图：



PIN	SYMBOL	DESCRIPTION	Remarks
1	3V3	3.3V 供电	主板预留测试点
2	EN	芯片使能脚，正常使用时，模组默认悬空 (外部预留 10K 上拉到 3.3V)	
3	RXD1	1 路串口 RX---与外部 MCU 通信	
4	TXD1	1 路串口 TX---与外部 MCU 通信	
6	IO15	GPIO (若需使用此 GPIO，模组外部需预留 10K 电阻下拉到 GND)	
7	BooT_SEL	预留测试点即可，用于模组产测、手动更新固件	
8	GPIO17	预留测试点即可，用于模组产测、手动更新固件	
9	GND	GND	
11	RXD2	2 路串口 RX---Debug	
12	TXD2	2 路串口 TX---Debug	
15	Reset	复位脚 (低电平有效，外部预留 10K 上拉到 3.3V)	

11. Mechanical，Environmental and Reliability Tests

（机械、环境和可靠性测试）

Test Items		Test Conditions	Qty	Criteria Condition
11-1	**Drop test**	The packed samples within 100Kg can be tested Drop height: Face Side: 800/600/450mm Edge line: 600/450/350mm Drop time: 1 each Face and edge.	1xBox	After drop test， the outer box and inner box will not been broken by appearance visual inspection.
11-2	**Vibration test**	X-Y-Z direction， first Frequency changing from 10Hz to 30Hz to 10Hz，amplitude 0.75mm， 5 times vibrations， then frequency Changing from 30Hz to 55 Hz to 30 Hz，amplitude 0.15mm， 5 time vibration.	3	After test， the Appearance， Power EVM and Frequency error shall be satisfied with the specification.
11-3	**Impact test**	Impact acceleration: 50m/sec2; Impact duration: 16ms; Impact times: 1000.	3	After test， the Appearance， Power EVM and Frequency error shall be satisfied with the specification.
11-4	**Soldering ability test**	Soldering temperature: 235±5℃ Soldering duration: 2±0.5S	3	1.After soldering， the soldered area must be covered by a smooth bright solder layer，some deficiencies such as a small amount of the pinhole，not wetting are allowed， but the deficiencies can not be in the same place; 2.At least 90% of soldered area shall be covered continuously by the soldering material.
11-5	**Humidity test**	Leave samples in 40±3℃，93% RH @ 96 hours	3	Leave samples in standard test condition for 2 hours then test， the Appearance，Power， EVM and Frequency error functional parameter shall be satisfied with the test specification.
10-6	**High temperatur**	Thermostat cabinet	60	After test， leave samples in standard condition for 1 hour and test， Power，

	e load life test	temperature: 55±5℃ Applied voltage: 110% rated voltage Working duration: 200 hour (Supply Voltage Cycle 23h power on，1h power off)		EVM and Frequency error shall be satisfied with the test specification.
11-7	**High temperature load test**	Temperature: 55±5℃ Samples work for 16 hours	3	After test，the Appearance，Power，EVM and Frequency error shall be Satisfied with the test specification.
11-8	**Low temperature storage test**	Leave the samples in -25±3℃@24 hours	3	Leave samples in standard test condition for 2 hours then test， the Appearance，Power，EVM and Frequency error shall be satisfied with the test specification.
11-9	**Low temperature load test**	Leave samples in -15±3℃@ 2 hours， samples' function shall be normal， the let samples work for 1 hour	3	After test， leave the samples in standard condition and tested the Appearance，Power，EVM and Frequency error shall be satisfied with the test specification.
11-10	**Temperature circle test**	One cycle duration -10±3℃@3H 40±3℃ @3H Total cycle: 10x	3	After test， leave the samples in standard condition and tested Power EVM and Frequency error shall be qualified and all the characters shall be satisfied with the test specification.
11-11	**Continuous TP test**	Twice cycle duration -10±3℃@4H +60±3℃@4H， +25@2H@2H	3	During test， There will not been appeared signal disconnection or interruption between DUT and AP.
11-12	**ESD**	Discharge voltage: 1kV C: 150pF Discharge resistance：330Ω Positive10 times 1 time for each second	3	The products can recoverable smoothly after ESD test.

12. Package（包装）

（1）编带包装示意图

暂无

（2）外箱图纸示意图

暂无

（3）包装要求信息

暂无

13. Software Requirements（软件要求）

The driver supports the following operating systems: Microsoft Windows XP， Vista and Win7.

驱动程序支持以下操作系统：微软 Windows XP，Vista 和 win7。