



产 品 规 格 书

SPECIFICATION

产品名称: WLAN/BT 模块
Product name: WLAN/BT Module
产品型号: WF-MA80-2
Model: WF-MA80-2
客户名称:
Customer:
版本: V1.0
Version: V1.0

客户承认 CUSTOMER APPROVED
签名: signature:
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产品规格书变更履历表

Revision History

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1. 介绍 (Introduction)

信华 WF-MA80-2 模块集成 WIFI6 和 BT5.4 的功能。使用 44 管脚 12mm*12mm QFN(P) 封装, 专为满足客户小尺寸、低成本的需求而设计。该模块可以满足有无线连接需求与娱乐设备的要求。

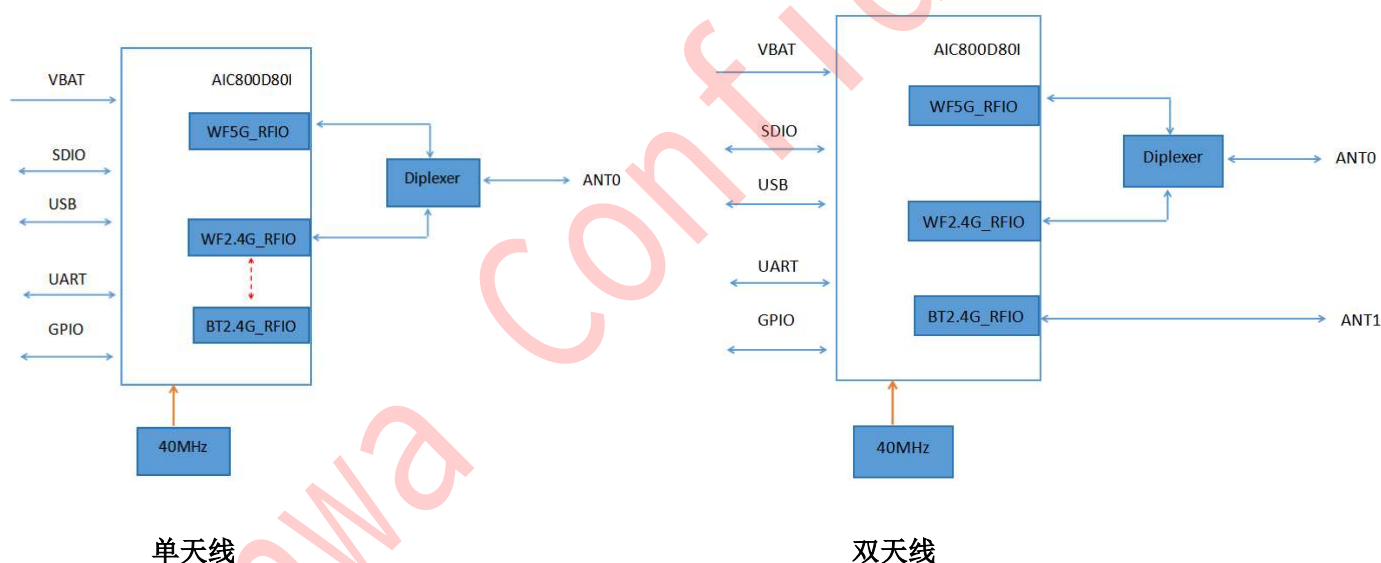
WLAN/BT 功能支持 USB2.0 / SDIO3.0 接口, BT 功能支持 UART 接口, 符合 IEEE 802.11 a/b/g/n/ac/ax 标准协议要求。

该模块可运用于智能音箱, 机顶盒, 游戏机, 打印机, IP 摄像头, 行车记录仪等其它智能设备。

Shinwa WF-MA80-2 module integrates WIFI6 and BT5.4 functions. The 44-pin 12mm*12mm QFN(P) package is designed to meet customer needs in small size and low cost. This module can meet the requirements of wireless connection and entertainment equipment. WLAN/BT function supports USB2.0 / SDIO3.0 interface, BT function supports UART interface, Comply with IEEE 802.11a /b/g/n/ac/ax standard protocol requirements.

The module can be applied in smart sound boxes, set-top boxes, game machines, printers, IP cameras, tachographs, and other smart equipment.

1.1 外围接口概要 (External interface general)



1.2 功能特征 (Function Character)

- 支持 SDIO/USB2.0/UART/PCM 接口
Supports SDIO/ USB2.0/UART/PCM interface
- 集成低功耗定时器和看门狗
Integrated low power timer and watchdog

1.2.1 WLAN 特点 (WLAN Features)

- CMOS 单芯片完全集成 RF、Modem 和 MAC

CMOS single-chip fully-integrated RF, Modem and MAC

- 支持 2412-2462MHz/5GHz Wi-Fi6
Support 2412-2462MHz/5GHzWi-Fi6
- 20/40/80MHz 带宽下的理论速率高达 600.4Mbps
Theoretical rates up to 600.4Mbps at 20/40/80 MHz bandwidth
- 支持 5MHz/10MHz 模式
Support 5MHz/10MHz mode
- 同时支持 STA、AP、Wi-Fi Direct 模式
Support STA, AP, Wi-Fi Direct mode concurrently
- 支持 STBC、波束赋形
Support STBC, beamforming
- 支持 Wi-Fi6 TWT
Support Wi-Fi6 TWT
- 支持两个 NAV、缓冲区报告、空间复用、多 BSSID、PPDU 内电源
Support two NAV, buffer report, space reuse, Multi-BSSID, intra-PPDU power
- 支持 LDPC
Support LDPC
- 支持 MU-MIMO、OFDMA
Support MU-MIMO, OFDMA
- 支持 DCM、Mid-amble、UORA
Support DCM, Mid-amble, UORA
- 支持 WEP/WPA/WPA2/WPA3-SAE 个人、多功能一体机
Support WEP / WPA / WPA2 / WPA3-SAE Personal, MFP

1.2.2 BT 特点 (BT Features)

- 支持蓝牙 5.4 的所有强制和可选功能
Supports all the mandatory and optional features of Bluetooth5.4
- 支持先进的主从拓扑
Supports advanced master and slave topologies

2. 主要参数(Main Parameters)

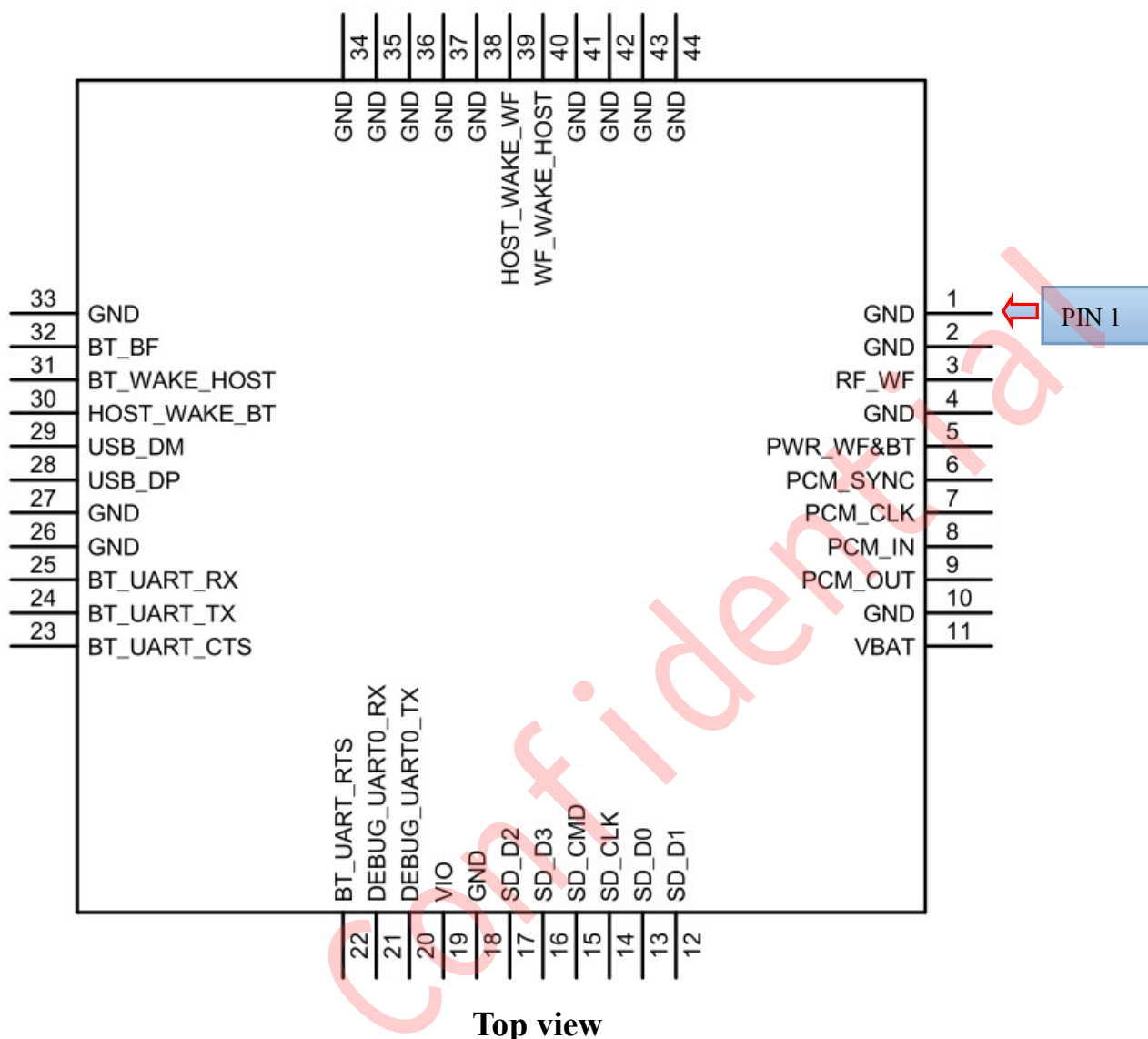
蓝牙 (Bluetooth)	
标准 (Standard)	蓝牙 5.4
频率范围 (Frequency Band)	2.402G ~ 2.480G
RF 阻抗 (RF Input Impedance)	50 ohms
接口 (Interfaces)	UART,USB2.0

WLAN	
标准 (Standard)	802.11 a/b/g/n/ac/ax
频率范围 (Frequency Band)	2412MHz~2462MHz /5180MHz~5825MHz
RF 阻抗 (RF Input Impedance)	50 ohms
接口 (Interfaces)	SDIO3.0,USB2.0
工作环境 (operate condition)	
输入电源 VBAT	DC 3.16 ~ 3.46V (Type 3.3V)
输入电源 VIO	DC 1.7~1.9V OR 3.16 ~ 3.46V (Type 1.8V OR 3.3V)
温度 (Temperature)	-40°C to +85°C
湿度 (Humidity)	10%~90% Non-Condensing
潮敏等级(MSL Level)	3
尺寸与称重 (Dimension)	
尺寸(Dimension)	12mm(L)*12mm(W)*2.4mm(H)
重量 (weight)	0.764g
硬件与软件信息(Hardware and Firmware information)	
硬件版本(Hardware version)	WF-MA80-2 V1.1 240701

Remark: If USB interface is selected, both Bluetooth and WIFI should use USB.

3. 设计应用 (Design Application)

3.1 管脚配置 (Pin Assignment)



3.2 管脚定义(Pin Define)

管脚序号 PIN NO	管脚名称 Pin Name	I/O 类型 I/O Type	描述 Description
1	GND	Ground	Ground
2	GND	Ground	Ground
3	RF_WF	RF	WLAN 2.4G and 5G Antenna(Reserved)
4	GND	Ground	Ground
5	PWR_WF&BT	Input	WL&BT enable
6	PCM_SYNC	Input/Output	PCM Synchronization control
7	PCM_CLK	Input/Output	PCM clock
8	PCM_IN	Input	PCM data Input

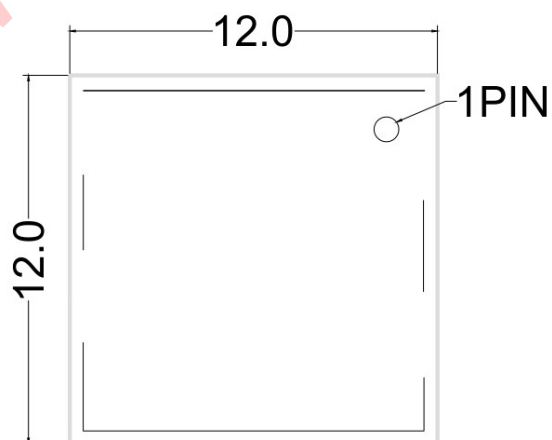
9	PCM_OUT	Output	PCM data Output
10	GND	Ground	Ground
11	VBAT	POWER	3.3V Supply Voltage
12	SD_D1	Input/Output	SDIO Data Line1
13	SD_D0	Input/Output	SDIO Data Line 0
14	SD_CLK	Input	SDIO Clock Input
15	SD_CMD	Input/Output	SDIO Command
16	SD_D3	Input/Output	SDIO Data Line 3
17	SD_D2	Input/Output	SDIO Data Line 2
18	GND	Ground	Ground
19	VIO	POWER	1.8V~3.3V Supply Voltage IF use sdio3.0 vio=1.8v
20	DEBUG_UART0_TX	Input	Debug serial port TX Hang in the air when not in use, no need to connect
21	DEBUG_UART0_RX	Output	Debug serial port RX Hang in the air when not in use, no need to connect
22	BT_UART_RTS	OUT	High-Speed UART RTS
23	BT_UART_CTS	IN	High-Speed UART CTS
24	BT_UART_TX	OUT	High-Speed UART Data Out
25	BT_UART_RX	IN	High-Speed UART Data In
26	GND	Ground	Ground
27	GND	Ground	Ground
28	USB_DP	Input/Output	USB data D+ Hang in the air when not in use, no need to connect
29	USB_DM	Input/Output	USB data D- Hang in the air when not in use, no need to connect
30	HOST_WAKE_BT	Input	HOST to wake-up Bluetooth device
31	BT_WAKE_HOST	Output	Bluetooth device to wake-up HOST
32	RF_BT	Input/Output	Bluetooth ant
33	GND	Ground	Ground

34	GND	Ground	Ground
35	GND	Ground	Ground
36	GND	Ground	Ground
37	GND	Ground	Ground
38	GND	Ground	Ground
39	HOST_WAKE_WF	Input	HOST to wake-up WLAN device
40	WF_WAKE_HOST	Output	WLAN device to wake-up HOST
41	GND	Ground	Ground
42	GND	Ground	Ground
43	GND	Ground	Ground
44	GND	Ground	Ground

3.3 模块尺寸图 (Module dimension)

模块尺寸 12×12 (单位: mm) 公差: $\pm 0.2\text{mm}$

Module Size 12×12 (unit: mm) tolerance: $\pm 0.2\text{mm}$



3.4 模块实物图(view of the module)

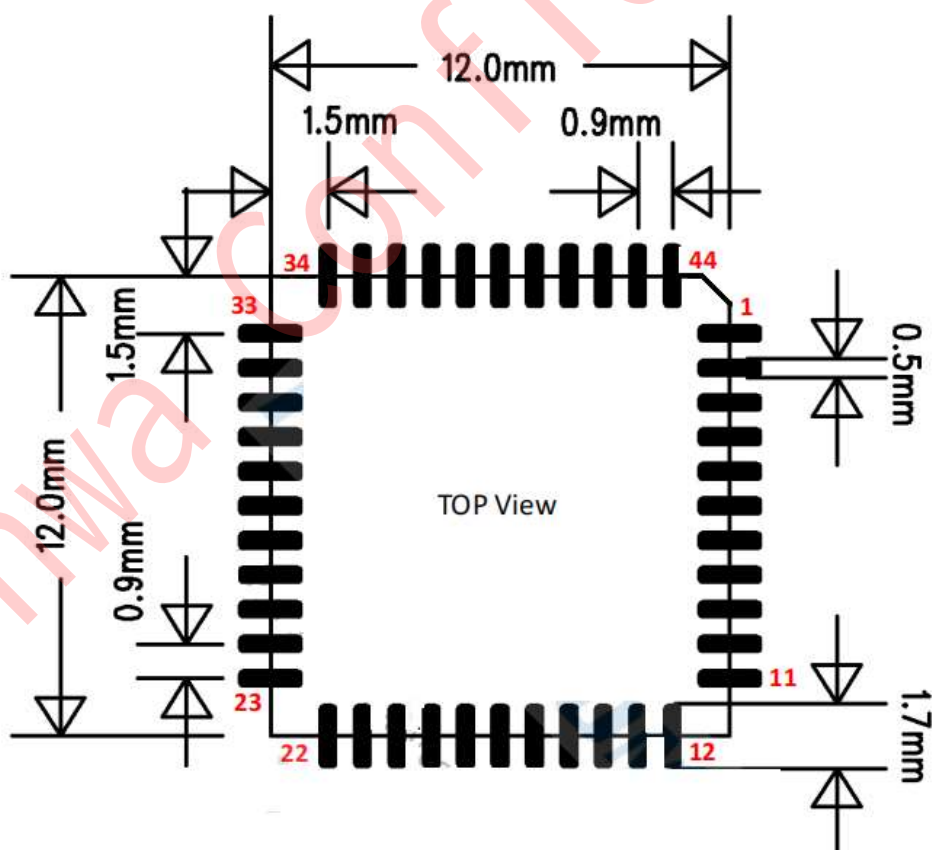
顶层 (TOP)



底层 (Bottom)



3.5 模组封装参考 (Recommended Module Mounting Pattern)



Top view

4. 电气特性(Electrical Character)

4.1 最大范围 (Max Range)

参数 Parameter		最小 Min	最大 Max	单位 Unit
VBAT (VDD_3V3_WL)		3.0	3.6	V
VIO (VDD_IO)		1.71	1.89	V
		3.16	3.46	V
工作温度范围 Operating temperature range		-40	+85	°C
存储温度范围 Storage temperature range		-40	+90	°C
ESD承受电压 ESD Stress Voltage To be updated after the completion of QUAL	Human Body Model	-2000	+2000	V

4.2 常规要求及操作环境(General Requirements and Operation)

参数 Parameter	最小 Min	标准 Type	最大 Max	单位 Unit
VBAT (VDD_3V3_WL)	3.16	3.3	3.46	V
VIO (VDD_IO)	1.71	1.8	1.89	V
	3.16	3.3	3.46	V
IO高电平输入电压 V_{IH} IO high-level input voltage	$0.7 \times V_{IO}$	-	V_{IO}	V
IO低电平输入电压 V_{IL} IO low-level input voltage	0	-	$0.3 \times V_{IO}$	V

5. 标准测试条件 Standard test condition

5.1 标准条件 Standard condition:

温度: +23°C±5°C

Temperature: In a range of +23°C±5°C

6.模块 RF 性能 (Module RF Performances)

6.1 WLAN 性能 (WLAN Performances)

6.1.1 WLAN RF 2.4 GHz Tx characteristics per chain operation at 25°C

Normal Condition: VDD=3.3V VIO=1.8V

Parameter	Comments			Min	Typ	Max	Unit
RF frequency range	Center frequency at 5 MHz spacing			2400		2485	MHz
Parameter	Modulation	Data rate	Conditions	Min	Typ	Max	Unit
Tx output power	802.11b CCK	1 Mbps	Mask compliant	14	~	20	dBm
	802.11b CCK	11 Mbps	Mask compliant	14	~	20	dBm
	802.11g OFDM	6 Mbps	Mask compliant	14	~	20	dBm
		54 Mbps	Mask compliant	11	~	19	dBm
	802.11ac VHT20	MCS0	Mask compliant	14	~	20	dBm
		MCS7	EVM limited (-27 dB)	11	~	19	dBm
	802.11ac VHT40	MCS0	Mask compliant	14	~	20	dBm
		MCS9	EVM limited (-32 dB)	10	~	18	dBm
	802.11ax HE20	MCS0	Mask compliant	14	~	20	dBm
		MCS11	EVM limited (-32 dB)	9	~	17	dBm
	802.11ax HE40	MCS0	Mask compliant	14	~	20	dBm
		MCS11	EVM limited (-35 dB)	8	~	16	dBm

6.1.2 WLAN RF 5 GHz Tx characteristics per chain operation at 25°C

Normal Condition: VDD=3.3V VIO=1.8V

Parameter	Comments			Min	Typ	Max	Unit
RF frequency range	Center frequency at 5 MHz spacing			5150		5825	MHz
Parameter	Modulation	Data rate	Conditions	Min	Typ	Max	Unit
Tx output power	802.11a OFDM	6 Mbps	Mask compliant	14	~	20	dBm
		54 Mbps	EVM limited (-25 dB)	11	~	19	dBm
	802.11ac VHT20	MCS0	Mask compliant	14	~	20	dBm
		MCS7	EVM limited (-27 dB)	11	~	19	dBm
	802.11ac VHT40	MCS0	Mask compliant	14	~	20	dBm
		MCS9	EVM limited (-32 dB)	10	~	18	dBm

	802.11ac VHT80	MCS0	Mask compliant	14	~	20	dBm
		MCS9	EVM limited (-32 dB)	10	~	18	dBm
	802.11ax HE20	MCS0	Mask compliant	14	~	20	dBm
		MCS11	EVM limited (-35 dB)	9	~	17	dBm
	802.11ax HE40	MCS0	Mask compliant	14	~	20	dBm
		MCS11	EVM limited (-35 dB)	9	~	17	dBm
	802.11ax HE80	MCS0	Mask compliant	14	~	20	dBm
		MCS11	EVM limited (-35 dB)	8	~	16	dBm

6.1.3 WLAN RF 2.4 GHz Rx characteristics per chain operation at 25°C

Normal Condition: VDD=3.3V VIO=1.8V

Parameter	Comments		Min	Max	Unit
RF frequency range			2400	2485	MHz
Sensitivity at 10% PER	Modulation	Data rates	Min	Max	Unit
Sensitivity (CCK)	802.11b CCK	1 Mbps	—	-80	dBm
	802.11b CCK	11 Mbps	—	-76	dBm
Rx Sensitivity (OFDM)	802.11g	6 Mbps	—	-82	dBm
		54 Mbps	—	-65	dBm
	802.11ac VHT20	MCS0	—	-82	dBm
		MCS7	—	-64	dBm
	802.11ac VHT40	MCS0	—	-79	dBm
		MCS9	—	-54	dBm
Rx Sensitivity (OFDMA)	802.11ax HE20	MCS0	—	-82	dBm
		MCS11	—	-52	dBm
	802.11ax HE40	MCS0	—	-79	dBm
		MCS11	—	-49	dBm

6.1.4 WLAN RF 5 GHz Rx characteristics per chain operation at 25°C

Normal Condition: VDD=3.3V VIO=1.8V

Parameter	Comments		Min	Max	Unit
RF frequency range			5150	5825	MHz
Sensitivity at 10% PER	Modulation	Data rates	Min	Max	Unit
Rx Sensitivity (OFDM)	802.11a	6 Mbps	—	-82	dBm
		54 Mbps	—	-65	dBm
	802.11ac VHT20	MCS0	—	-82	dBm

		MCS7	—	-64	dBm
	802.11ac VHT40	MCS0	—	-79	dBm
		MCS9	—	-54	dBm
	802.11ac VHT80	MCS0	—	-76	dBm
		MCS9	—	-51	dBm
Rx Sensitivity (OFDMA)	802.11ax HE20	MCS0	—	-82	dBm
		MCS11	—	-52	dBm
	802.11ax HE40	MCS0	—	-76	dBm
		MCS11	—	-49	dBm
	802.11ax HE80	MCS0	—	-76	dBm
		MCS11	—	-46	dBm

6.3 蓝牙性能 (BT Performance)

6.3.1 蓝牙性能 (BT Performance)

参数 Parameter		条件 Condition	单位 Unit	标准 Std
测试频率范围 Test frequency range		2402 to 2480 MHz	MHz	
初始载波容限 ICFT (Initial Carrier Frequency Tolerance)		通道 0 Channel 0	KHz	-75~75
		通道 39 Channel 39	KHz	
		通道 78 Channel 78	KHz	
输出功率 Output Power		通道 0 Channel 0	dBm	-6~4
		通道 39 Channel 39	dBm	-6~4
		通道 78 Channel 78	dBm	-6~4
载波频率漂移 Carrier Frequency Drift	通道 : 0 Channel: 0	DH1	KHz	25~-25
		DH1 Drift rata/50us	KHz	-20~20
		DH3	KHz	-40~40
		DH3 Drift rata/50us	KHz	-20~20
		DH5	KHz	-40~40
		DH5 Drift rata/50us	KHz	-20~20
	通道 : 39 Channel: 39	DH1	KHz	-25~25
		DH1 Drift rata/50us	KHz	-20~20
		DH3	KHz	-40~40
		DH3 Drift rata/50us	KHz	-20~20
		DH5	KHz	-40~40
		DH5 Drift rata/50us	KHz	-20~20
	通道 : 78 Channel: 78	DH1	KHz	-25~25
		DH1 Drift rata/50us	KHz	-20~20

		DH3	KHz	-40~40
		DH3 Drift rata/50us	KHz	-20~20
		DH5	KHz	-40~40
		DH5 Drift rata/50us	KHz	-25~25
调制特性 Modulation characteristic	通道：0 Channel: 0	Dflavg	KHz	140~175
		Df2avg	KHz	≥115
		Df2avg/Dflavg		≥0.8
	通道：39 Channel: 39	Dflavg	KHz	140~175
		Df2avg	KHz	≥115
		Df2avg/Dflavg		≥0.8
	通道：78 Channel: 78	Dflavg	KHz	140~175
		Df2avg	KHz	≥115
		Df2avg/Dflavg		≥0.8
单/多时隙灵敏度 Sensitivity (single/ multi slot packets) (Power=-70dBm)		通道 0 Channel 0		BER ≤ 0.1%
		通道 39 Channel 39		BER ≤ 0.1%
		通道 78 Channel 78		BER ≤ 0.1%
最大输入电平 Maximum input Level (Power=- 20dBm)		通道 0 Channel 0		BER ≤ 0.1%
		通道 39 Channel 39		BER ≤ 0.1%
		通道 78 Channel 78		BER ≤ 0.1%

6.3.2 蓝牙 EDR 性能 (BT EDR Performance)

参数 Parameter	条件 Condition	单位 Unit	标准 Std
测试频率范围 Test frequency range	2402 to 2480 MHz	MHz	
EDR 载波频率稳定性和调制准确度 EDR carry frequency accuracy and modulation accuracy	RMS DEVM(EDR2)		< 0.2
	RMS DEVM(EDR3)		< 0.13
	Channel: 99% DEVM(EDR2)		< 0.3
	0/39/78 99% DEVM(EDR3)		< 0.2
	Peak DEVM(EDR2)		< 0.35
	Peak DEVM(EDR3)		< 0.25
灵敏度 Sensitivity (Power=-70dBm)	通道: 0/39/78	EDR2	BER≤0.1%
	Channel: 0/39/78	EDR3	BER≤0.1%
最大输入电平 Maximum input Level (Power=-20dBm)	通道: 0/39/78	EDR2	BER≤0.1%
	Channel: 0/39/78	EDR3	BER≤0.1%

7. 可靠性测试 (Reliability Test)

7.1 可靠性测试项目 (Reliability Test)

测试项目 Test Item	规格 Specification
高温存储 High Temperature(Storage)	在 90℃环境下放置 96 小时，然后在常温条件下放置 2 小时后测试，模块应满足可靠性要求。 Place 96 hours at 90℃ environment, and 2 hours at normal temperature and humidity then test ,module should meet reliability requirements
低温存储 Low Temperature(Storage)	在-40℃环境下放置 96 小时，然后在常温条件下放置 2 小时后测试，模块应满足可靠性要求。 Place module 96 hours at -40℃environment, and 2 hours innormal temperature and humidity then test ,module should meet reliability requirements
高湿存储 High Humidity(Storage)	在 +60℃，90%RH环境下放置96小时，然后在常温条件下放置2小时后测试，模块应满足可靠性要求。 At the temperature of +60℃, 90%RH environment for 96 hours, and2 hours at normal temperature and humidity, then test, module should meet reliability requirements
高温上电 High temperature power-on	模块在+85℃环境连续上电 96 小时，通电结束后恢复常温后两小时内测试,模块均能够满足性能标准。 The modules are continuously powered on at +85 °Cfor 96 hours, and tested within two hours after resuming normal temperature after power-on ,module should meet reliability requirements
低温上电 Low Temperature power-on	模块在-40℃环境连续通电 96 小时，通电结束后恢复常温后两小时内测试,模块均能够满足性能标准。 The modules are powered on continuously for 96 hours at -40℃ and tested within two hours after resuming normal temperature after the power is over. module should meet reliability requirements

高低温循环 High and low temperature cycling test	模块在 85℃环境下放置 30 分钟，然后温度降低到到-40℃（温度转换时间为 2 个小时）放置 30 分钟；然后温度升高到 85℃放置 30 分钟（温度转换时间为 2 个小时），如此重复循环 10 次。然后在常温条件下放置 2 小时后测试，模块应满足可靠性性能标准。 Testing Max 85℃ 30 min s, Temperature shift time: within 2hrs. Testing Min -40℃ 30 min , Repeat 10 cycles. The module should be cold to normal temperature for two hours, module should meet reliability requirements
高低温冲击 High and low temperature Shock Test	高低温冲击：模块在+85℃，0.5 小时 -40±3℃，0.5 小时，温度转换时间 5 分钟内，循环 50 次，在标准条件下放置 2 小时后测试。模块应满足可靠性性能标准 +85s℃,0.5hour, -40±3℃,0.5hour, Temperature shift time within 5mins,50cycles, Take measurements after 2hours in normal condition.
振动实验 Vibration Resistance	振动频率：10～200Hz，扫频速率：0.1 oct/min，最大加速度：2.5G。X，Y，Z 三个方向各两个小时，振动完成后三小时内常温条件下测试，模块应满足可靠性性能标准。 Freq: 10~200Hz, 0.1 oct/min, max acceleration: 2.5Grms- Test time: X, Y, Z axis for 6 hours. After 1 hour vibration test, do the test in each direction. In normal temperature condition, take measurements within 3 hours. module should meet reliability requirements
冲击测试 Shock Test	冲击测试：冲击加速度：70G(m/sec²)；冲击时间：11 毫秒；冲击频率和方向：6 个方向每个方向 10 次。在常温条件下三个小时内测试，模块应满足可靠性性能标准 Shock Test: Impact acceleration: 70G(m/sec²), impact time: 11 m Second, impact frequency and direction: 10 times each in 6 directions. In normal temperature condition, take measurements within 3hr, module should meet reliability requirements
静电试验 Electrostatic Resistance	人体模型，等效电容=150pF，放电电阻=330Ω，±2kV，3 次，间隔 0.5 秒，在标准条件下放置 2 小时后测试（仅限于对屏蔽罩和地测试）。 Human body model, C=150pF,R=330Ω,±2kV, INT=0.5S/3times, Take measurements after 2hours in normal condition (Only for shield case and GND).

备注:remark

a、本规格书中的规格、性能是采用信华公司提供的控制电路来测试定义

The standard and performance in specification are defined using the control circuit of SHINWA

b、在满足规格书的范围内，为了改良、提高性能，有时会进行相应的设计变更，请理解

The parts are subject to change with any improvement within the range of the specification without prior notice

c、从发行之日起 1 个月以内，一定要将已承认的规格书返还。超过 1 个月未返还的，SIC 将作为已承认处理，请理解 Please return the recognized specifications within a month from the issued date. It is over a month from the issued date, we will think that specification is recognized.

8. 产品使用注意事项(Product Using Notice)

1.不要在超过各种电气部品额定条件的状态下使用。需要匹配模块的 1.8 VIO 口电压。

Do not use in more than a variety of electrical parts under the condition of rated condition. Need 1.8V IO port voltage matching module.

2. 因 RF 信号线是非常关键的线路，减少附近元器件对模块的信号干扰。

Since RF signal line is the key line, so try to reduce signal interference.

3.模块产品在使用过程中是易静电破坏产品，请注意防静电。

Module using process is easy to damage by static products, please the main electrostatic discharge.

4.WIFI 和 BT 由于两者都工作在 2.4G 频段，同时工作时存在信道竞争问题，可能会出现以下状况：

Both WIFI and BT work in the 2.4G band, At the same time channel competition problems at work, the following conditions army occur:

1).BT 在工作时，WIFI 连接时间有可能超过 45 秒；

BT at work, WIFI connection time may arise more than 45 seconds.

2).BT 在工作时，WIFI 可能出现断线；

BT at work, WIFI sometimes may appear offline.

3).WIFI 在工作时，BT 可能出现断音或者掉线；

WIFI at work, BT may appear staccato or dropped.

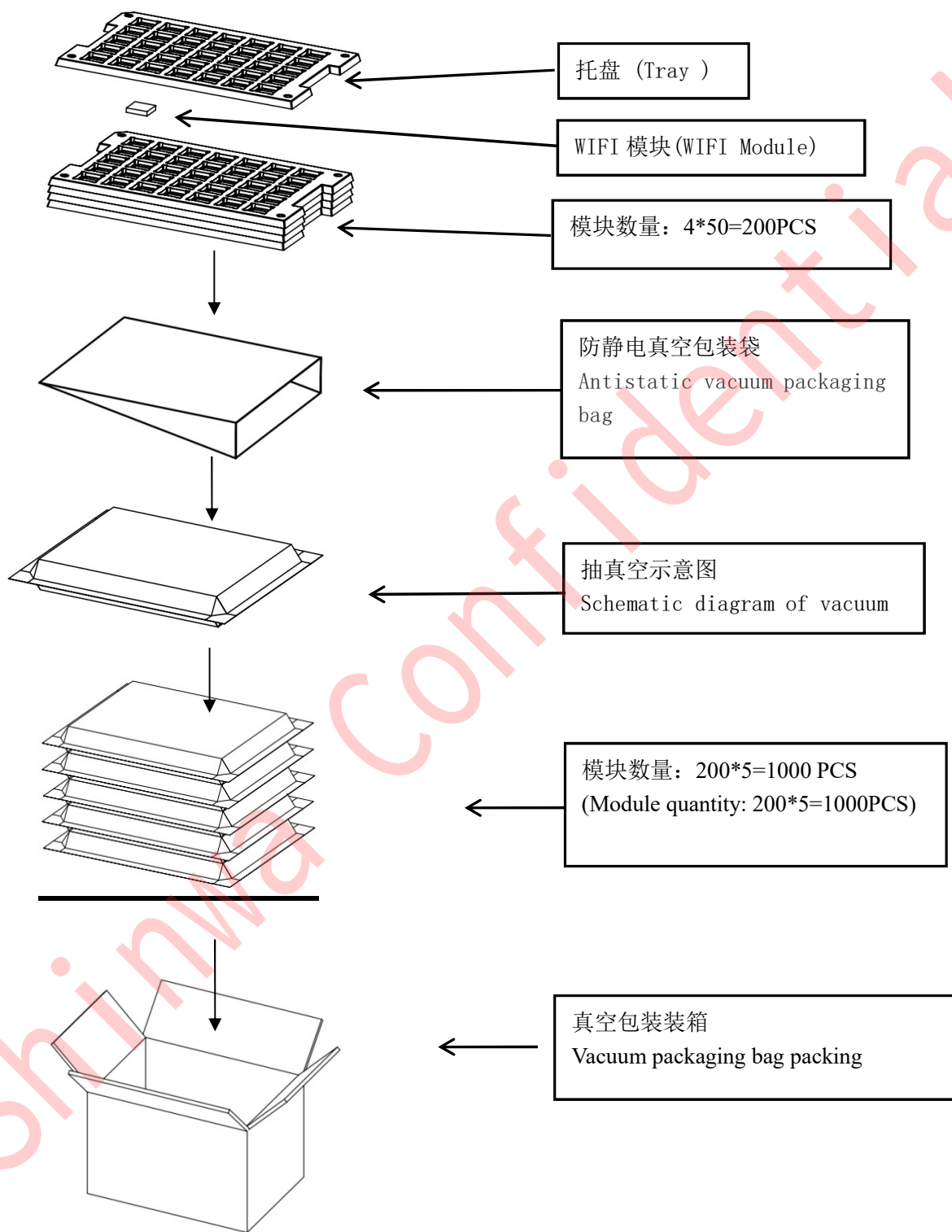
5.由于模块的尺寸较大且存在邮票孔的情况，焊接时可以采用开阶梯钢网的方式

Due to the large size of the module and the stamp hole, the ladder steel mesh can be used

9. 包装信息 (Package Information)

模块出货采用真空包装出货，包装示意图如下：

Module shipments by vacuum packaging, packing diagram as follows:



外包装箱尺寸 (Outer packing box size) : 285*203*211mm

Remark:外箱标签规格 (Label Specification On Packing Box)

此标签会依照客户的要求进行打印，否则将按照信华模块通用标签规格打印。

This label will be printed according to the customer's requirements,
otherwise it will be printed according to general label specification of Shinwa module.

10. 附录(appendices)

备注：以下附录仅供参考
Remark: Reference only

附录 1（appendix 1） Reset Power-Up/down system

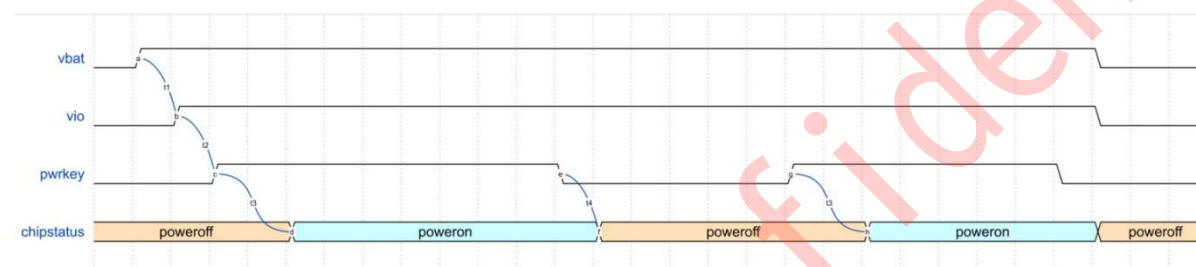
说明：模块复位/上电体系（Reset / Power up system）

在 VBAT 和 VIO 供电后，BT_EN 和 WL_EN 无效（低电平无效），整个设备处于关闭状态。

After VBAT and VIO are fed to Device and while BT_EN and WL_EN are de-asserted (LOW), the device is in Shutdown state.

处于关闭状态时诸如内部 DC/DC、内部 LDO 等模块均失效，对功能模块的供电都被切断。

While in Shutdown state all functional blocks, internal DC/DC's and LDO's will be disabled. The power supplied to the functional blocks is cut off.



t1: VIO's power on time $\geq$ VBAT's

t2: power key's high time $\geq$ VIO's +200us

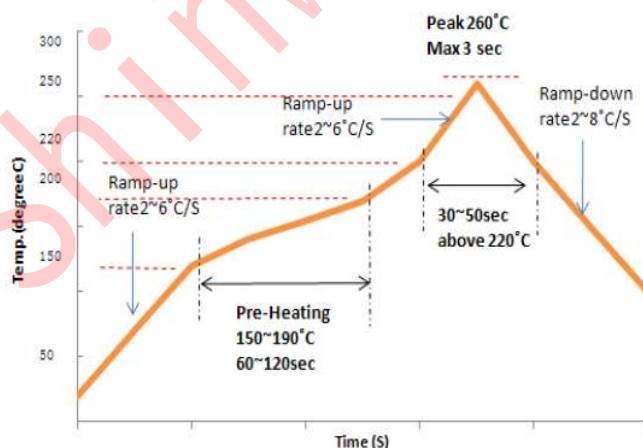
t3: chip all power on ready time $\geq$ power key high time + 8ms

t4: pwrkey pull low to chip all power off time $\geq$ 6ms

附录 2（appendix 2） 回流焊温度参考曲线（Recommended Reflow Temperature Profile）

无铅工艺器件温度曲线：

Pb-Free Parts Heat Resist Temperature Profile:



工艺流程 Process	无铅焊接要求 Lead-Free solder condition
预热温度 Pre-Heat	150~190 °C
预热时间 Pre-Heat Time	60~120 S
高温极限 Time above liquids	Above +220 °C 30~55S
最高温度 Peak temperature	+260 °C
最高温度持续时间 Time of peak temperature	3 S

备注 Remark

1、模块允许最多 2 次过炉

Reflow soldering is allowable 2 times maximum

2、为保证焊接良好，需要在过回炉过程中增加氮气

In order to have better SMT solder performance, please add Nitrogen during reflow process

附录 3 (appendix 3) 手工焊接事项 (The Hand-soldering Information)

模块的手工焊接参考以下要求

The Modules can withstand the following hand soldering specification

1、烙铁头温度需要设置在 $360\pm 10^{\circ}\text{C}$

The soldering iron tip temperature should be set to $360\pm 10^{\circ}\text{C}$

2、模块的手工焊接时间需在 3 秒以内

The manual soldering time should be within 3 second.

附录 4 (appendix 4) 存储条件 (Storage Condition)

为了满足模块的焊接和存储要求，需要保持以下条件：

The following conditions should be kept for soldering and keeping in storage for the module

1、在干燥的袋子里保存期限：在低于 40°C ，90% RH 条件下保存 12 个月

Shelf life in dry bag: 12 months at $<40^{\circ}\text{C}$ and 90% RH

2、包装袋开封后，模块必须进行回流焊接或者同等条件的处理

After bag is opened, module should be subjected to soldering reflow or equivalent processing

a) 在低于 30°C ，60%RH 工厂条件下，168 小时内(floor time)进行焊接

soldering within 168hrs at factory condition of $<30^{\circ}\text{C}$, 60%RH

b) 在低于 10%RH 环境中存储

Stored at $<10\%$ RH

3、如果处于以下条件，模块在焊接前需要烘烤

Modules will be required baking before mounting

a) 当存储室温不为 $23\pm 5^{\circ}\text{C}$ ，湿度 $>10\%$ 时

Storage Room temperature is not $23\pm 5^{\circ}\text{C}$ and humidity $>10\%$ RH

b) 不能满足上面 2 中 a 或 b 条件

Above item 2.a OR 2.b are not met

4、如果需要烘烤，模块需要放置在耐高温器皿中，在 125°C 的环境下烘烤 8 小时

If dry baking is required, modules should be baked for 8hrs

5、烘烤过后，放置在室温下一个小时，然后使用

After baking, leave it for 1 hour at room temperature then use it

附录 5（appendix 5）HCI UART Interface

The module supports the HCI UART transport layer as defined in the Bluetooth Core Specification, Version 4.0, Volume 4, Part A. In addition to communication with the host, the HCI UART interface also supports Bluetooth software (in-band) sleep control. The HCI UART interface circuit use digital I/O pins that receive power from the VDD_IO supply. Their I/O performance specifications meet the requirements stated.

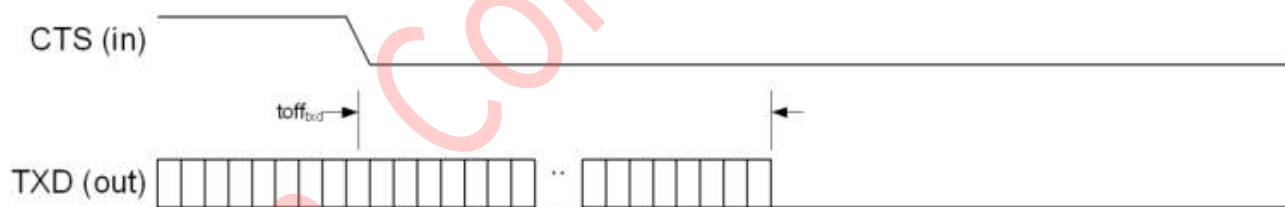
The HCI UART transport layer uses the following setting for RS232.

UART Parameters

UART parameter	Value
Number of data bits	Eight
Parity bit	No parity
Stop bit	One stop bit
Flow control	RTS/CTS (hardware)
Flow off response	Two bytes maximum
Supported transport bit rates (bps) ¹	9.6 K, 19.2 K, 38.4 K, 57.6 K, 115.2 K, 125 K, 230.4 K, 250 K, 460.8 K, 500 K, 720 K, 921.6 K, 1 M, 1.6 M, 2 M, 3 M, 3.2 M, with an accuracy of +1.5/-2.5%
Host baud rate tolerance	±3%

1. UART maximum baud rate is 3.2 Mbps.

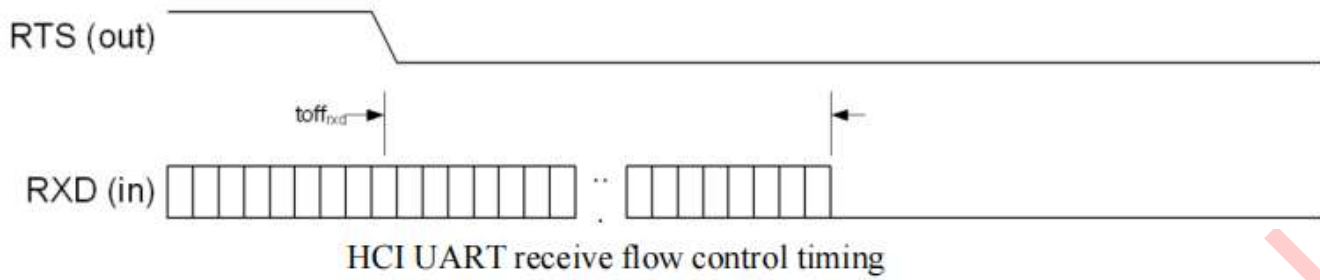
The HCI UART transmit timing is showing as follows. The HCI UART receive timing is showing as follows.



HCI UART transmit flow control timing

Parameter	Description	Min	Typ	Max	Unit
$toff_{txid}$	Delay from CTS to TXD stop	—	—	1	byte

HCI UART transmit flow control timing



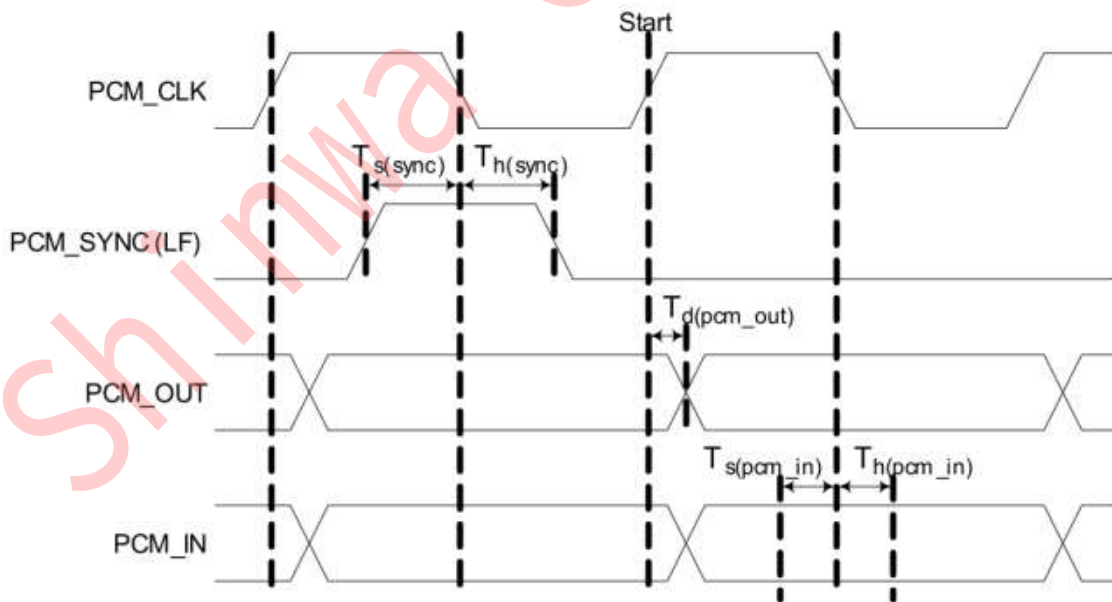
Parameter	Description	Min	Typ	Max	Unit
$toff_{rxd}$	Delay from RTS to RXD stop	16	—	—	byte

HCI UART receive flow control timing

附录 6（appendix6） PCM interface specifications

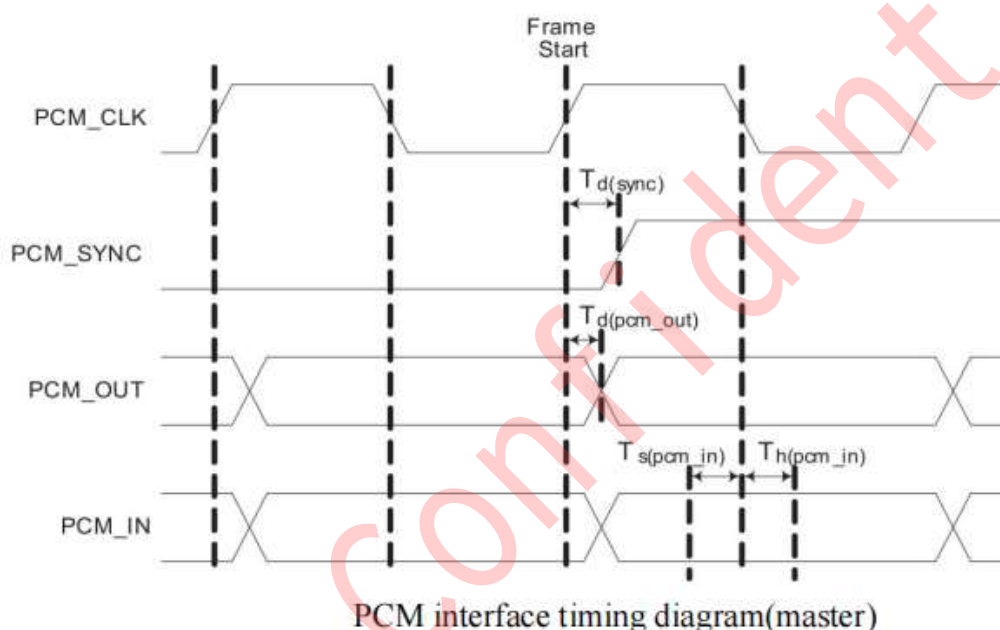
Parameter	Description	Min	Typ	Max	Units
Clock rate (slave)	Determined by the master	64	—	2,048	kHz
Clock rate (master)	$(32 \text{ MHz} * N/4,000)$, in which N is an integer, $8 \leq N \leq 256$	64	—	2,048	kHz
Frame size	—	1	8	256	Bits
Slot size	—	1	13	16	Bits
Slot number	Number of slots that can be configured per frame	1	—	32	Slots/frame

Example timing diagrams and specifications for slave and master configurations are described in the following tables and illustrations.



PCM interface timing in slave mode

Symbol	Description	Min	Typ	Max	Units
$F_{\text{pcm_clk}}$	PCM_CLK frequency	64	–	2,048	kHz
$T_{\text{spcm_sync}}$	Setup time PCM_SYNC to PCM_CLK fall	0	–	–	ns
$T_{\text{hpcm_sync}}$	Hold time PCM_CLK fall to PCM_SYNC fall	150	–	–	ns
$T_{\text{dpcm_out}}$	Delay from PCM_CLK rise to PCM_OUT	0	–	150	ns
$T_{\text{spcm_in}}$	Setup time PCM_IN to PCM_CLK fall	0	–	–	ns
$T_{\text{hpcm_in}}$	Hold time PCM_IN after PCM_CLK fall	150	–	–	ns

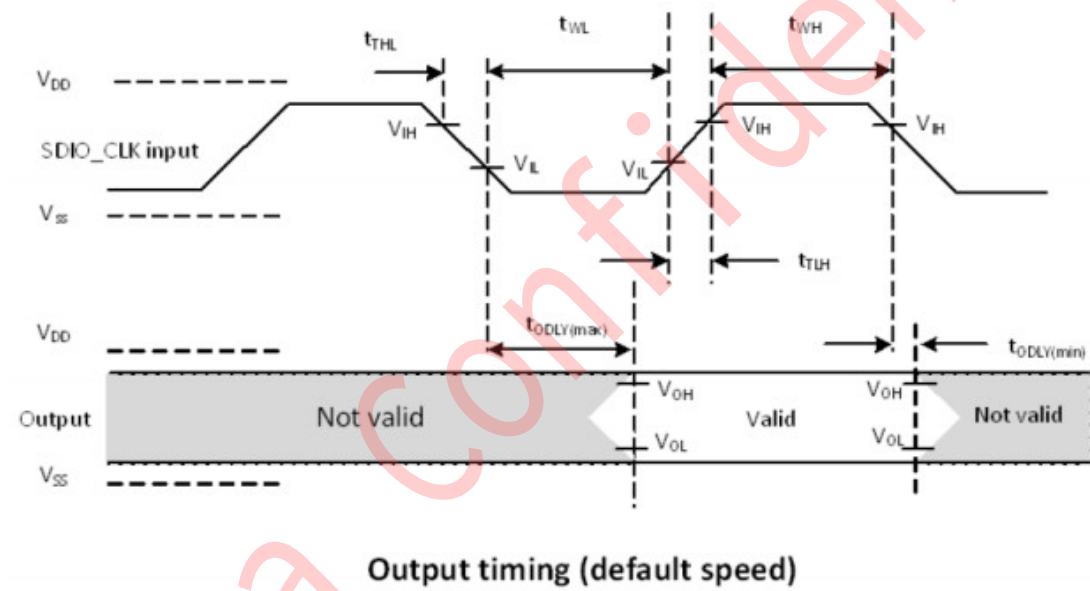
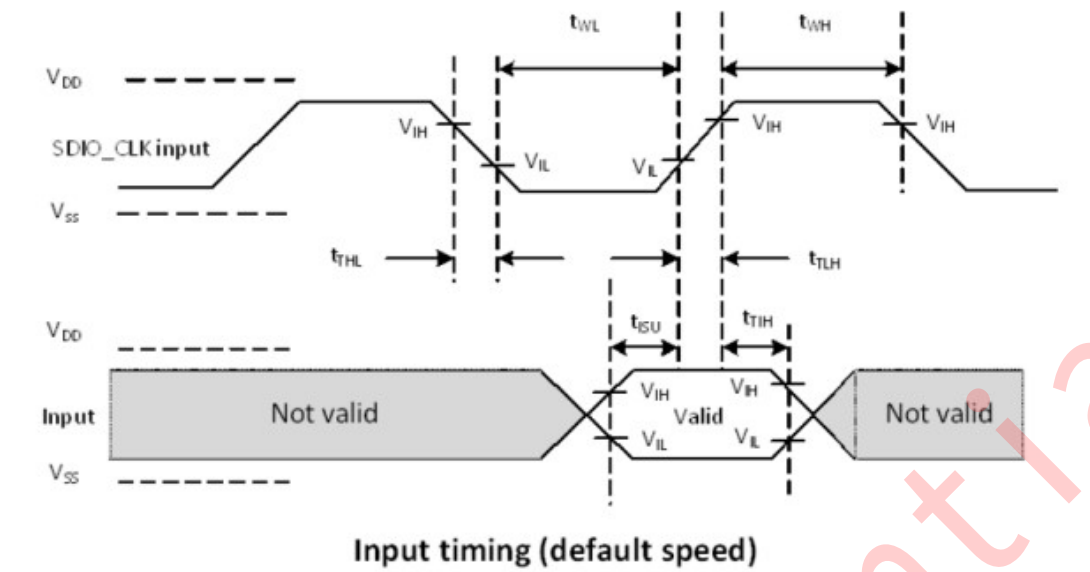


PCM interface timing in master mode

Symbol	Description	Min	Typ	Max	Units
$F_{\text{pcm_clk}}$	PCM_CLK frequency	64	–	2048	kHz
$T_{\text{d_sync}}$	Delay from PCM_CLK rise to long SYNC	-10	–	50	ns
$T_{\text{d_pcm_out}}$	Delay from PCM_CLK rise to PCM_OUT	-10	–	50	ns
$T_{\text{spcm_in}}$	Setup time PCM_IN to PCM_CLK fall	50	–	–	ns
$T_{\text{hpcm_in}}$	Hold time PCM_IN after PCM_CLK fall	150	–	–	ns

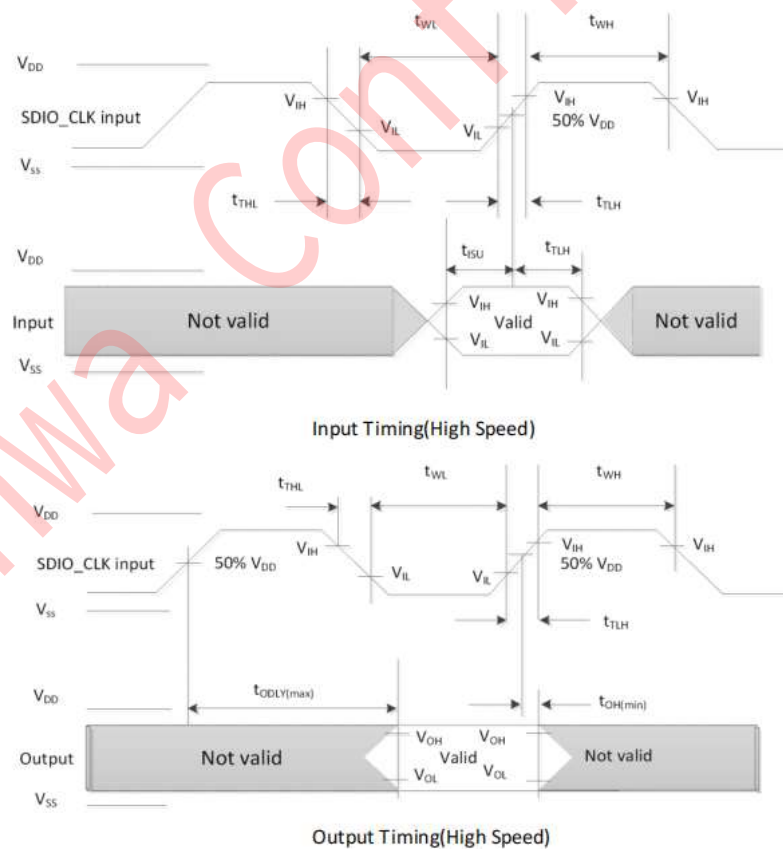
附录 7 (appendix 7) SDIO Interface Timing

1.DS Mode



Parameter	Symbol	Min	Max	Unit
Clock CLK (all values are referred to min (V_{IH}) and max (V_{IL}))				
Clock frequency Data Transfer Mode	f_{pp}	0	25	MHz
Clock frequency Data Identification Mode	f_{OD}	0 ¹ /100	400	kHz
Clock low time	t_{WL}	10	—	ns
Clock high time	t_{WH}	10	—	ns
Clock rise time	t_{TLH}	—	10	ns
Clock fall time	t_{THL}	—	10	ns
Inputs CMD, DAT (referenced to CLK)				
Input set-up time	t_{ISU}	5	—	ns
Input hold time	t_{IH}	5	—	ns
Outputs CMD, DAT (referenced to CLK)				
Output Delay time during Data Transfer Mode	t_{ODLY}	0	14	ns
Output Delay time during Identification Mode	t_{ODLY}	0	50	ns

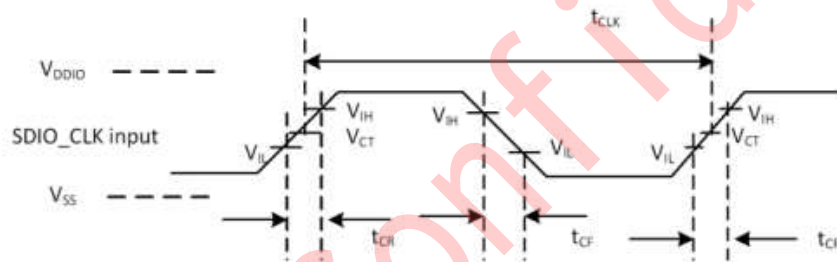
2.HS Mode



Parameter	Symbol	Min	Max	Unit
Clock CLK (all values are referred to min (V_{IH}) and max (V_{IL}))				
Clock frequency Data Transfer Mode	f_{pp}	0	50	MHz
Clock low time	t_{WL}	7	—	ns
Clock high time	t_{WH}	7	—	ns
Clock rise time	t_{TLH}	—	3	ns
Clock fall time	t_{THL}	—	3	ns
Inputs CMD, DAT (referenced to CLK)				
Input set-up time	t_{ISU}	6	—	ns
Input hold time	t_{IH}	2	—	ns
Outputs CMD, DAT (referenced to CLK)				
Output Delay time during Data Transfer Mode	t_{ODLY}	0	14	ns
Output Hold time	t_{OH}	2.5	—	ns
Total System capacitance for each line	C_L	—	40	pF

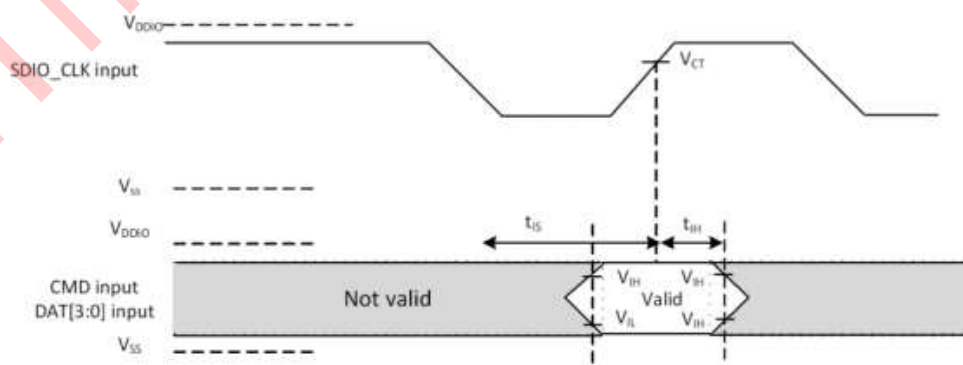
3.SDR Mode

Clock signal timing



Symbol	Min	Max	Unit	Remark
t_{CLK}	4.80	—	ns	208MHz (max.) between rising edge, $V_{CT}=0.975V$
t_{CR}, t_{CF}	—	$0.2 \cdot t_{CLK}$	ns	$t_{CR}, t_{CF} < 0.96ns$ (max.) at 208MHz, $C=10$ pF
Clock duty	30	70	%	

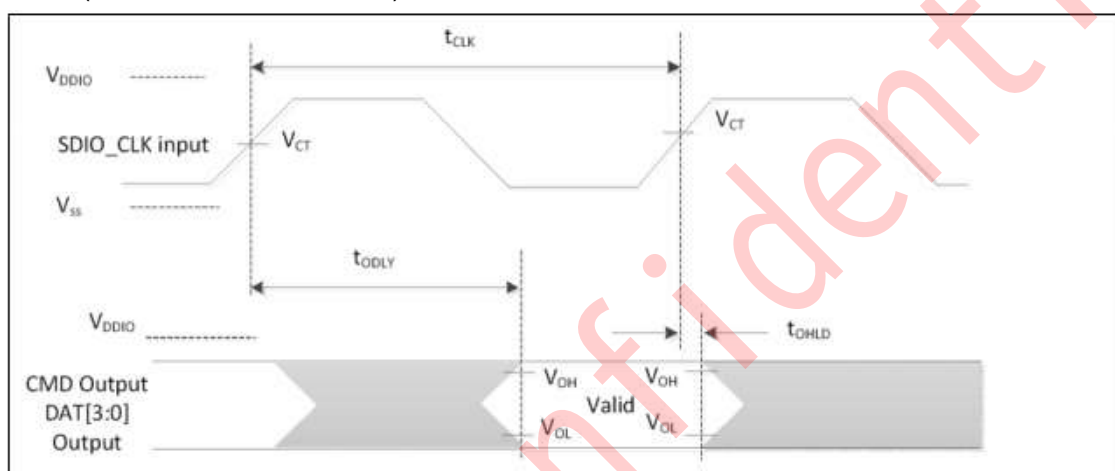
Input timing



Symbol	Min	Max	Unit	SDR104 mode
t_{IS}	1.4	—	ns	$C = 10 \text{ pF}$, $V_{CT}=0.975V$
t_{IH}	0.8	—	ns	$C = 10 \text{ pF}$, $V_{CT}=0.975V$
Symbol	Min	Max	Unit	SDR12, SDR25 and SDR50 modes
t_{IS}	3.00	—	ns	$C = 10 \text{ pF}$, $V_{CT}=0.975V$
t_{IH}	0.80	—	ns	$C = 10 \text{ pF}$, $V_{CT}=0.975V$

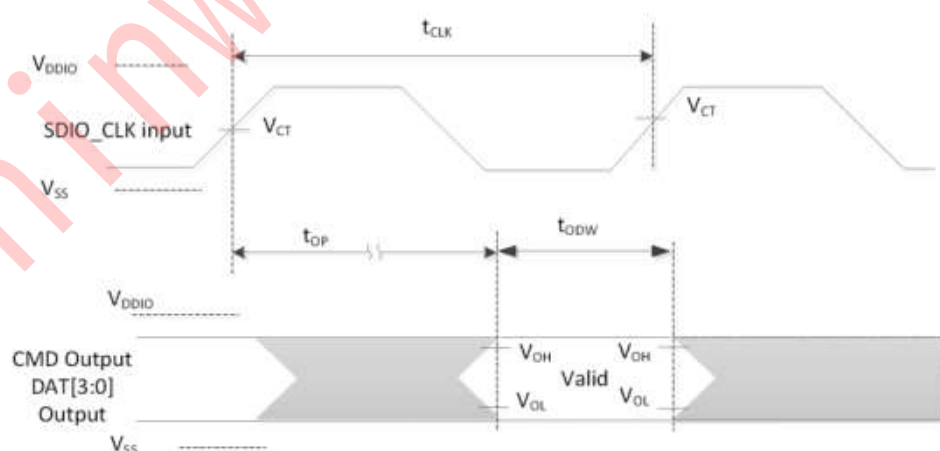
4. Output timing

Fixed data window(SDR12, SDR25, SDR50)



Symbol	Min	Max	Unit	Remark
t_{ODLY}	—	7.5	ns	$T_{CLK}=10ns$, $CL=30 \text{ pF}$, driver B for SDR50'wr
t_{TODLY}	—	14	ns	$T_{CLK}=20ns$, $CL=40 \text{ pF}$, driver B for SDR25,12
t_{OH}	1.5	—	ns	Hold time at the t_{ODLY} , $CL=15 \text{ pF}$

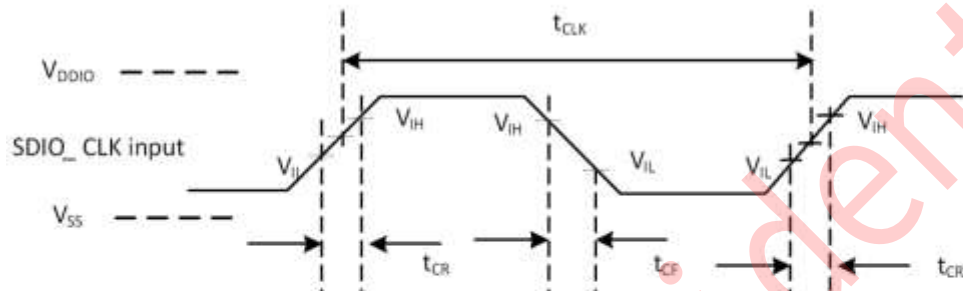
Output timing of variable window(SDR104)



Symbol	Min	Max	Unit	Remark
t_{OP}	0	2	ns	Output phase
Δt_{OP}	-350	+1550	ps	Delay variation due to temperature change after tuning
t_{ODW}	0.6	—	UI	$t_{ODW}=2.88\text{ns}$ at 208 MHz.

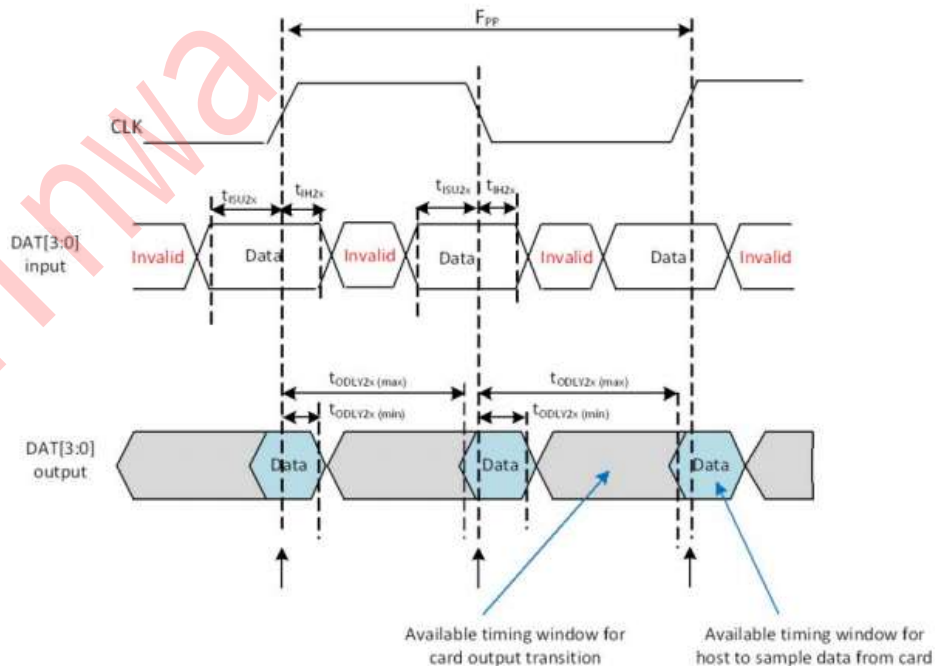
5.DDR50 Mode

Clock timing



Symbol	Min	Max	Unit	Remark
t_{CLK}	20	—	ns	50 MHz (max)
t_{CR}, t_{CF}	—	$0.2 \cdot t_{CLK}$	ns	$t_{CR}, t_{CF}=4\text{ns}$ (max) at 50 MHz. $C=10\text{ pF}$
Duty	45	55	%	Duty cycle

BUS timing for DDR50



Parameter	Symbol	Min	Max	Unit	Remark
Input CMD (referenced to CLK rising edge)					
Input setup time	t _{ISU}	6	—	ns	C ≤10 pF
Input hold time		0.8	—	ns	C ≤10 pF
Output CMD (referenced to CLK rising edge)					
Output delay time	t _{ODLY}	—	13.7	ns	CL≤30 pF
Output hold time	t _{OH}	1.5	3	ns	CL≥15 pF
Input DAT (referenced to CLK rising edge)					
Input setup time	t _{ISU2X}	3	—	ns	C ≤10 pF
Input hold time	t _{IH2X}	0.8	—	ns	C ≤10 pF
Output DAT (referenced to CLK rising edge)					
Output delay time	t _{ODLY Y2X}	—	7.0	ns	CL≤25 pF
Output hold time	t _{ODLY2X}	1.5	—	ns	CL≥15 pF

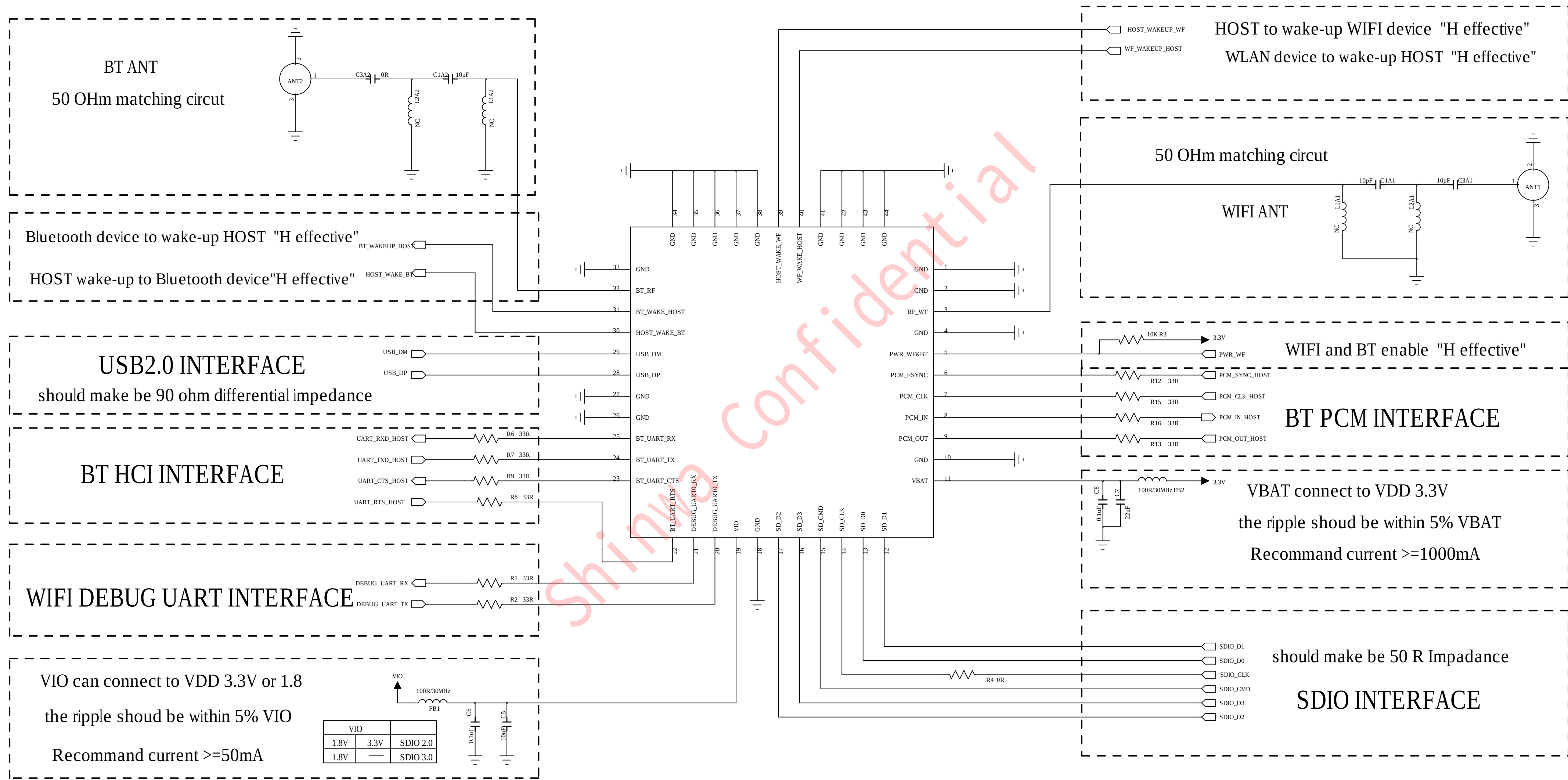
附录 8（appendix 8） 参考设计原理图（Reference Design Schematic）如下图所示；

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247 , FCC CFR Title 47 Part 15 Subpart E Section 15.407
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.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Note: 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.
FCC Radiation Exposure Statement
This modular 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.
If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: ZWYMA802
When the module is installed inside another device, the user manual of the host must contain below warning statements:
1. 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;
(2) This device must accept any interference received, including interference that may cause undesired operation.
Note: 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.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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.
Any company of the host device which install the modular with modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C :
15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, then the host can be sold legally.

FCC RF Radiation Exposure Statement
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
"To comply with FCC RF exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.
The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: ZWYMA802" Additionally, the following statement should be included on the label and in the final product's user manual:
"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."
The module is limited to installation in applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations. A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing), (B) limited and/or split modules not meeting all of the module requirements, and (C) simultaneous transmissions for independent collocated transmitters not previously granted together. This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user

Module Hardware Circuit reference design



MODEL NO: WF-MA80-2	 Shinwa industries(China) ltd			
DESCRIPTION: 2024-07-02	SHEET: 1		REVISION: V1.0	
	DRAWN BY	CHECKED BY	TECHNICS BY	ARRROVED BY
CODE NO:	Jason li			

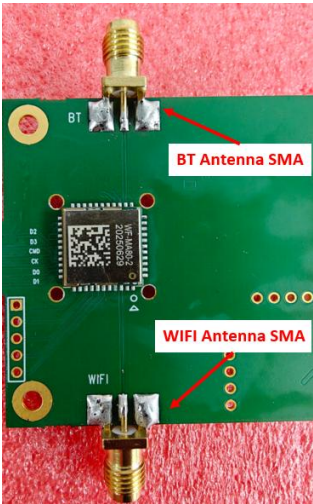
External antenna specification

外放天线照片



天线 port 照片

Antenna port photo



天线厂家: 2J Antennas(2J 天线有限公司)

Antenna manufacturer: 2J Antennas (2J Antenna Co., Ltd.)

天线型号: 2J6602Ba-SP

Antenna model: 2J6602Ba-SP

天线增益

antenna gain

Antenna	2410-2490 MHz	4920-7125MHz	Peak Gain
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	2.4G	5.0G	6G	
Cable 1	2	3.5	3.6	dBi
Cable 2	2.2	3.6	3.6	dBi

Please refer to the chart below for PCB size of RF line terminal.

