
WIFI+BT Module

Model Number:DT3HR1601

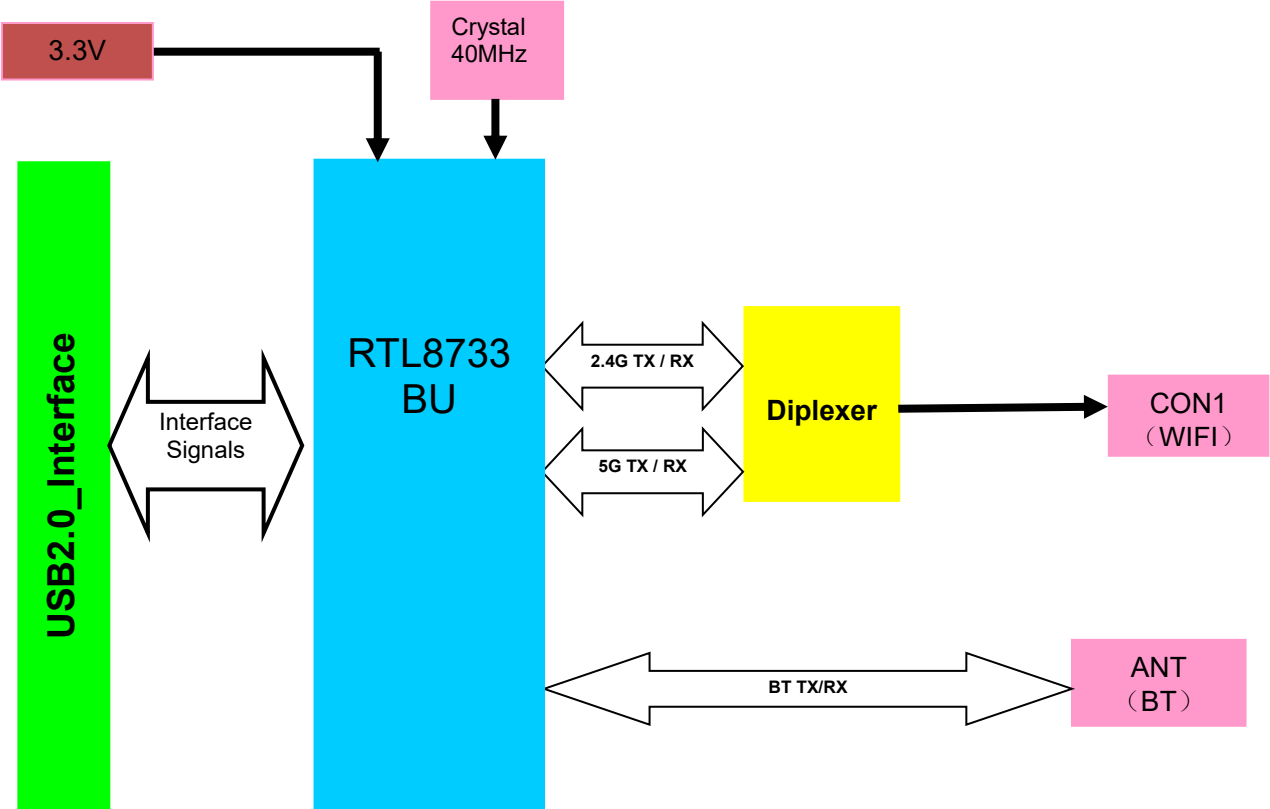
1. General Description

This document is to specify the product requirements for 802.11a/b/g/n USB Module. This Card is based on Realtek RTL8733BU-CG chipset which features a low power 1x1 11a/b/g/n dual-band Wi-Fi subsystem and a Bluetooth subsystem. 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 a combo chip. It provides a complete solution for a high-performance integrated wireless LAN and Bluetooth controller.

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 150Mbps data rate
- Support 20MHz, 40MHz bandwidth in 2.4G band and 5G band
- 802.11i(WPA,WPA2).Open, shared key, and pair-wise key authentication services
- Operation at 2.4~2.5GHz and 5.15~5.825GHz frequency band to meet worldwide regulations
- Bluetooth specification 2.1+EDR
- Bluetooth 4.2 Low Energy (LE)
- Bluetooth 5.2
- Complies with USB2.0 for WLAN and BT controller
- HSF compliant

3. Functional Block Diagrams



4. RF Characteristics

4.1 Part of 2.4GHz

4.1.1 IEEE 802.11b Section

	Feature	Detailed Description
4.1.1.1	Standard	IEEE 802.11b
4.1.1.2	Modulation Type	DQPSK,DBPSK and CCK with DSSS
4.1.1.3	Operating Frequency	2400 ~ 2483.5 MHz ISM band
4.1.1.4	Channel Numbers	13 channels for worldwide
4.1.1.5	Data Rate	at most 11Mbps
4.1.1.6	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C 17±2dBm at 11Mbps
4.1.1.7	EVM	1Mbps: ≤-10dB 11Mbps: ≤-10dB
4.1.1.8	Receiver Sensitivity at Antenna Connector	PER≤8% @25°C 1Mbps: ≤-83dBm 11Mbps: ≤-76dBm
4.1.1.9	Frequency Error	±20ppm

4.1.2 IEEE 802.11g Section

	Feature	Detailed Description
4.1.2.1	Standard	IEEE 802.11g
4.1.2.2	Modulation Type	BPSK,QPSK,16QAM,64QAM with OFDM
4.1.2.3	Operating Frequency	2400 ~ 2483.5MHz ISM band
4.1.2.4	Channel Numbers	13 channels for worldwide
4.1.2.5	Data Rate	at most 54Mbps
4.1.2.6	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C 15±2dBm at 54Mbps
4.1.2.7	EVM	6Mbps:≤-5dB 54Mbps:≤-25dB
4.1.2.8	Receiver Sensitivity at Antenna Connector	PER≤10% @ 25°C 6Mbps: ≤-85dB 54Mbps:≤-65dB
4.1.2.9	Frequency Error	±20ppm

4.1.3 IEEE 802.11n HT20 Section

	Feature	Detailed Description
4.1.3.1	Standard	• IEEE 802.11n
4.1.3.2	Modulation Type	• BPSK,QPSK,16QAM,64QAM with OFDM
4.1.3.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
4.1.3.4	Data Rate	• at most 72Mbps
4.1.3.5	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C • 14±2dBm at MCS7
4.1.3.6	EVM	• MCS0:≤-5dB • MCS7:≤-28dB
4.1.3.7	Receiver Sensitivity at Antenna Connector	PER≤10% @ 25°C • MCS0:≤-82dBm • MCS7:≤-64dBm
4.1.3.8	Frequency Error	• ±20ppm

4.1.4 IEEE 802.11n HT40 Section

	Feature	Detailed Description
4.1.4.1	Standard	• IEEE 802.11n
4.1.4.2	Modulation Type	• BPSK,QPSK,16QAM,64QAM with OFDM
4.1.4.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
4.1.4.4	Data Rate	• at most 150Mbps
4.1.4.5	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C • 14±2dBm at MCS7
4.1.4.6	EVM	• MCS0:≤-5dB • MCS7:≤-28dB
4.1.4.7	Receiver Sensitivity at Antenna Connector	PER≤10% @ 25°C • MCS0:≤-79dBm • MCS7:≤-61dBm
4.1.4.8	Frequency Error	• ±20ppm

4.2 Part of 5GHz

4.2.1 IEEE 802.11a Section

	Feature	Detailed Description
4.2.1.1	Standard	• IEEE 802.11a
4.2.1.2	Modulation Type	• BPSK,QPSK,16QAM,64QAM with OFDM
4.2.1.3	Operating Frequency	• 5.15~5.25GHz • 5.25~5.35GHz • 5.47~5.725GHz • 5.725~5.85GHz
4.2.1.4	Data Rate	• at most 54Mbps
4.2.1.5	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C • 15±2dBm at 54Mbps
4.2.1.6	EVM	• 6Mbps: $\leq -5\text{dB}$ • 54Mbps: $\leq -25\text{dB}$
4.2.1.7	Receiver Sensitivity at Antenna Connector	PER $\leq 10\%$ @ 25°C • 6Mbps: $\leq -85\text{dB}$ • 54Mbps: $\leq -65\text{dB}$
4.2.1.8	Frequency Error	• $\pm 20\text{ppm}$

4.2.2 IEEE 802.11n HT20 Section

	Feature	Detailed Description
4.2.2.1	Standard	• IEEE 802.11n
4.2.2.2	Modulation Type	• BPSK,QPSK,16QAM,64QAM with OFDM
4.2.2.3	Operating Frequency	• 5.15~5.25GHz • 5.25~5.35GHz • 5.47~5.725GHz • 5.725~5.85GHz
4.2.2.4	Data Rate	• at most 72Mbps
4.2.2.5	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C • 14±2dBm at MCS7
4.2.2.6	EVM	• MCS0: $\leq -5\text{dB}$ • MCS7: $\leq -28\text{dB}$
4.2.2.7	Receiver Sensitivity at Antenna Connector	PER $\leq 10\%$ @ 25°C • MCS0: $\leq -82\text{dBm}$ • MCS7: $\leq -64\text{dBm}$
4.2.2.8	Frequency Error	• $\pm 20\text{ppm}$

4.2.3 IEEE 802.11n HT40 Section

	Feature	Detailed Description
4.2.3.1	Standard	• IEEE 802.11n
4.2.3.2	Modulation Type	• BPSK,QPSK,16QAM,64QAM with OFDM
4.2.3.3	Operating Frequency	• 5.15~5.25GHz • 5.25~5.35GHz • 5.47~5.725GHz • 5.725~5.85GHz
4.2.3.4	Data Rate	• at most 150Mbps
4.2.3.5	Transmitter Output Power at Antenna Connector	Typical RF Output Power at each RF chain@25°C • 14±2dBm at MCS7
4.2.3.6	EVM	• MCS0:≤-5dB • MCS7:≤-28dB
4.2.3.7	Receiver Sensitivity at Antenna Connector	PER≤10% @ 25°C • MCS0:≤-79dBm • MCS7:≤-61dBm
4.2.3.8	Frequency Error	• ±20ppm

4.3 Part of BT

4.3.1 Bluetooth Section

	Feature	Detailed Description		
4.3.1.1	Bluetooth standard	Bluetooth V2.1+EDR, 4.2 and 5.2		
4.3.1.2	Modulation	GFSK, $\pi/4$-DQPSK and 8DPSK		
4.3.1.3	Operating Frequency	2402MHz-2480MHz		
4.3.1.4	Channel Numbers	79 channels for BDR+EDR 40 channels for BLE		
4.3.1.5	Symbol Rate	1, 2 and 3Mbps		
		Min (dBm)	Typical (dBm)	Max (dBm)
4.3.1.6	BDR Output Power	3	6	9
	BLE Output Power	3	6	9
4.3.1.7	Sensitivity @BER=0.1% FOR GFSK(1Mbps)	-96	-86	-70
	Sensitivity @BER=0.01% FOR $\pi/4$ -DQPSK(2Mbps)	-96	-86	-70
	Sensitivity @BER=0.01% FOR 8DPSK(3Mbps)	-96	-80	-70
	Sensitivity @PER=30.10% FOR BLE	-90		
4.3.1.8	Maximum input level	GFSK(1Mbps): -20dBm		
		$\pi/4$-DQPSK(2Mbps): -20dBm		
		8DQPSK(3Mbps): -20dBm		

5. Thermal and Electrical Characteristics

5.1 General Characteristics

Feature	Detailed Description
Operating Voltage	3.3V±10%
Current Consumption	<1000mA@TX <300mA @RX
Form Factor and Interface	USB2.0 interface for WIFI&BT

5.2 Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-40	+80	°C
Ambient Operating Temperature	0	+70	°C
Junction Temperature	0	+125	°C

5.3 DC Characteristics

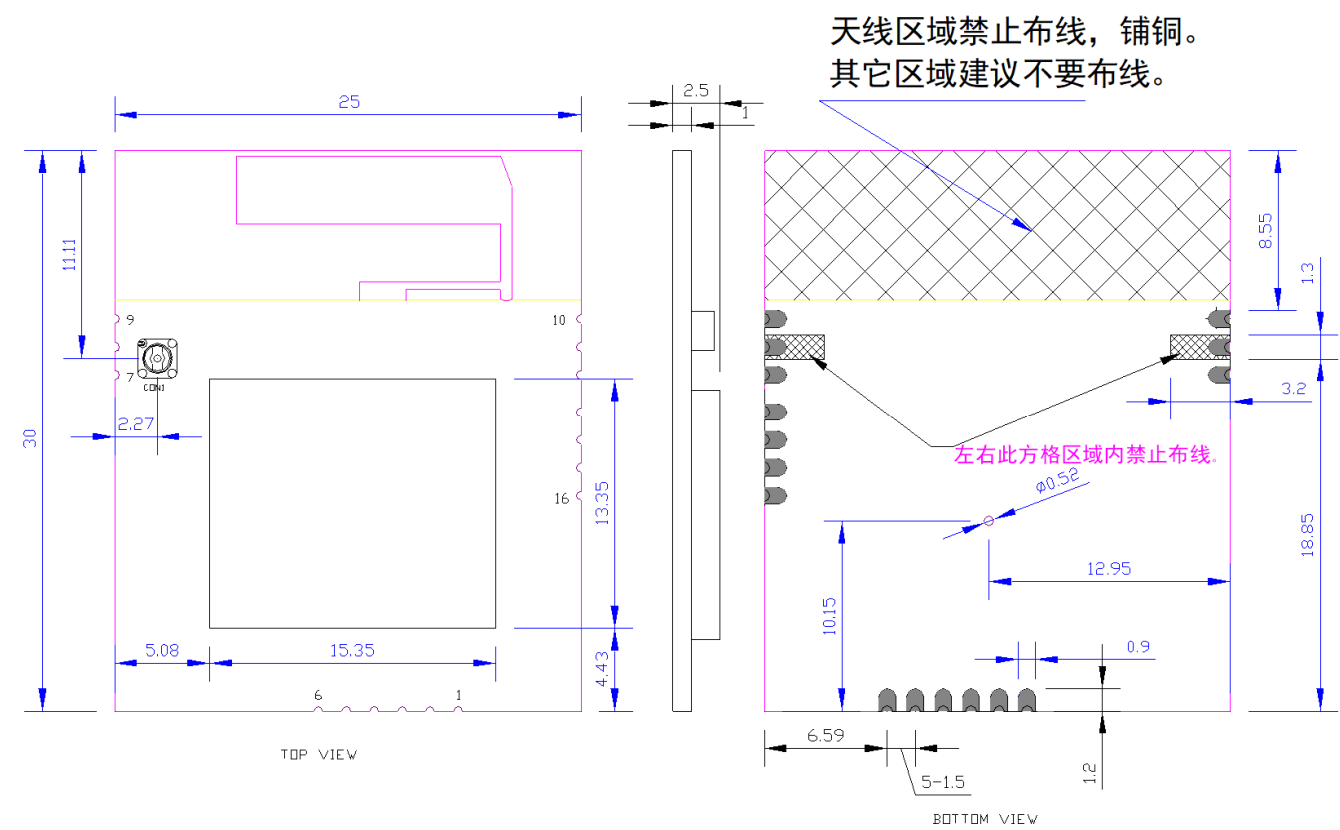
Symbol	Parameter	Min	TYPE	Max	Unit
V _{IL}	Input Low Voltage	--	0	0.5	V
V _{IH}	Input High Voltage	2.0	3.3	3.6	V
V _{OL}	Output Low Voltage	0	--	0.33	V
V _{OH}	Output High Voltage	2.97	3.3	3.6	V

6. Mechanical Characteristics

6.1 General Characteristics

	Feature	Detailed Description
6.1.1	Length	● 30mm
6.1.2	Width	● 25mm
6.1.3	Height	● 1.0mm(PCB) ● 2.5mm (module)
6.1.4	Weight	● TBD

6.2 Mechanical Dimensions



CON1: TX/RX (WIFI)
尺寸误差范围: (PCBA≤0.15mm)

DIM(MM)	Tolerance(MM)
0-5	±0.15
5-10	±0.20
10-50	±0.30
>50	±0.40

6.3 Pin Description

Pin	Symbol	Remark	I/O
1	GND	Ground	-
2	D-	USB D-	IO
3	D+	USB D+	IO
4	GND	Ground	-
5	VDD3.3	Power supply	P
6	VDD3.3	Power supply	P
7	GND	Ground	-
8	NC	NC	-
9	GND	Ground	-
10	GND	Ground	-
11	NC	NC （RF Reserve for BT）	-
12	GND	Ground	-
13	GND	Ground	-
14	BT_HOSTWAKE	BT wake host （Internal 10k resistor pull up 3.3V）	O
15	WL_HOST_WAKE	WiFi wake host （Internal 10k resistor pull up 3.3V）	O
16	RESERT	Reset controlled by main SOC （Internal 100k resistor pull up 3.3V and 0.1uF capacitor to ground）	I

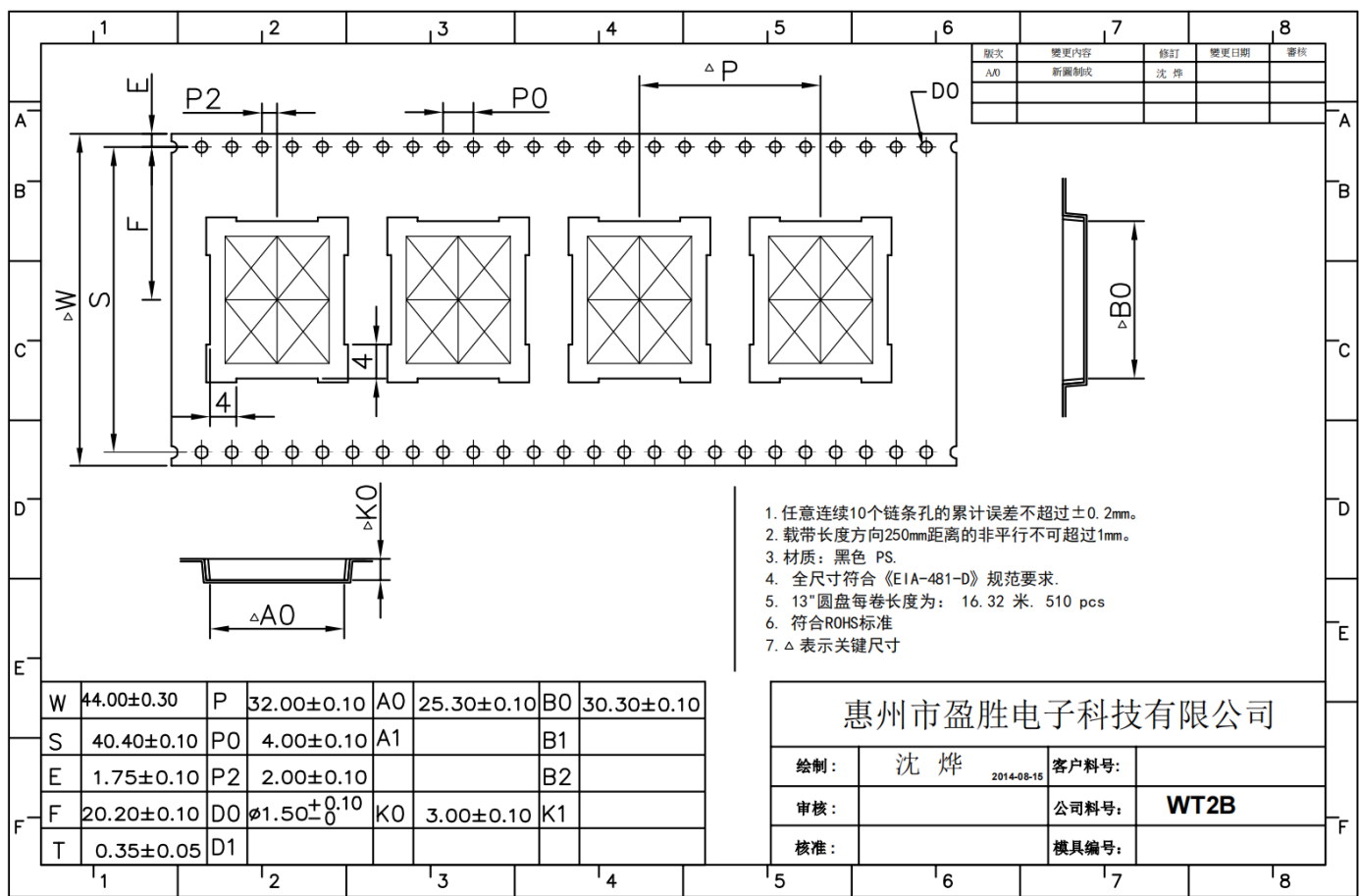
6.4 Product picture



7. Label list &Package

7.1 Module Label
(TBD)

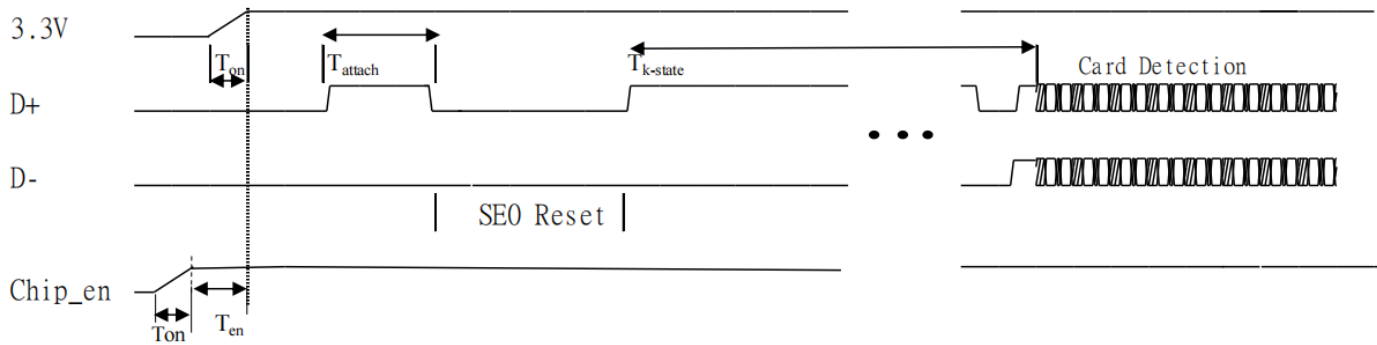
7.2 Package



(TBD)

8. Power on sequence timing & Reset

Power on Sequence



T_{on} : The main power ramp up duration

T_{attach} : USB attach state

$T_{k-state}$: the duration from resistor attached to USB host starting card detection procedure

T_{en} : Interval between the rising point of 3.3V and chip_en.

The power on flow description:

After main 3.3V ramp up, the internal power on reset is released by power ready detection circuit and the power management unit will be enabled. The power management unit enables the internal regulator and clock circuits.

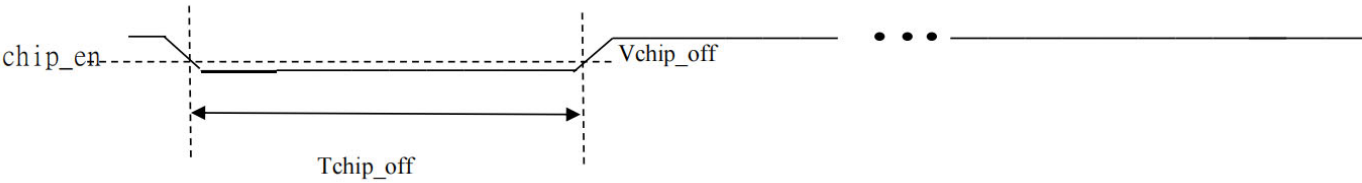
The power management unit also enables the USB circuits.

USB analog circuits attach resistors to indicate the insertion of the USB device.

	Unit	Min	Typical	Max
T_{on}	ms	0.2	1.5	5
T_{attach}	ms	100	250	--
$T_{k-state}$	ms	50	250	--
T_{en}	ms	--	-- ^①	--

^① There is no constraint on the chip_en and 3.3V power-on sequence.

Pin 16 RESERT (Chip_en RESET Power Sequence)

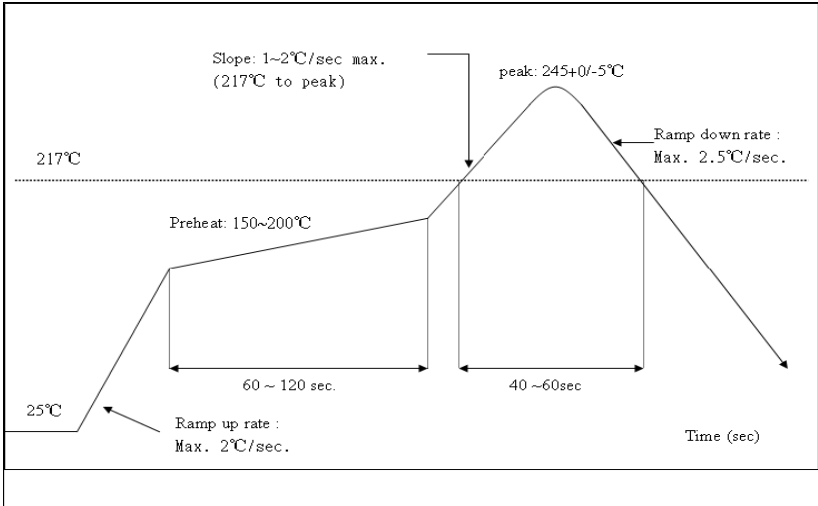


	Min	Typical	Max	Unit	Description
Tchip_off	10	100	--	ms	Chip_en reset time
Vchip_off	--	--	0.4	V	Chip_en reset voltage

When chip_en reset and on afterward, the voltage of chip_en must keep lower than Vchip_off, and the chip_en keeping off duration must be more than Tchip_off.

9. BOM(Part List)

关键器件清单
TBD



10. MSL
Moisture Sensitivity Level (MSL) : JEDEC L3

		Soak Requirements (濕度環境要求)				
	Floor Life (車間時間)	Standard (標準)			Accelerated (加速)	
Level	Time	Cond °C／%RH	Time (hrs)	Cond °C／%RH	Time (hrs)	Cond °C／%RH
1	unlimited	≤30/85%	168+5/-0	85/85	n/a	n/a
2	1 year	≤30/60%	168+5/-0	85/60	n/a	n/a
2a	4 weeks	≤30/60%	696+5/-0	30/60	120+1/-0	60/60
3	168 hours	≤30/60%	192+5/-0	30/60	40+1/-0	60/60
4	72 hours	≤30/60%	96+2/-0	30/60	20+0.5/-0	60/60
5	48 hours	≤30/60%	72+2/-0	30/60	15+0.5/-0	60/60
5a	24 hours	≤30/60%	48+2/-0	30/60	10+0.5/-0	60/60
6	TOL	≤30/60%	TOL	30/60	n/a	60/60

11. Recommended Reflow Profile

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

12. Wireless module before the SMT note:

1. When the customer makes the steel mesh, ensure that the hole is larger than the size of the wifi module pad, please press 1 to 1 and 0.7 mm is widened to open outward, the thickness of 0.12 mm.
2. Can't get the wifi module bare hands when needs, must we wear the gloves and static ring.
3. The furnace temperature according to the size of the customer the mainboard, generally like to stick on a tablet standard temperature of $245 \pm 5^{\circ}\text{C}$
4. Storage and use wifi module control should pay attention to the following matters:
Module of the storage life of vacuum packaging:
 - 4-1.1. Storage life: 12 months. Storage conditions: $<40^{\circ}\text{C}$. Relative humidity: $<90\%\text{R.H.}$
 - 4-2. After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be:
 - 4-3. Check the humidity card :
stored at $\leq 20\%\text{RH}$. If : $30\% \sim 40\%$ (pink) or greater than 40% (red), module has moisture absorption.
 - ① Mounthed within 168 hours at factory
conditions of: $t \leq 30^{\circ}\text{C}$, $\leq 60\%\text{RH}$.
 - ② Once opened, the workshop the preservation of life for 168 hours.
 - 4-4. If baking is required, devices may be baked for:
 - ① Modules must be to remove module moisture problem.
 - ② Baking temperature: 50°C , 72 hours.
 - ③ After baking, put proper amount of desiccant to seal packages.
 - 4-5. The actual number of module vacuum packing which is based on the actual number of packages to the customer requirements.
5. Module reel packaging items as follows.
 - 5-1. Storage life: 12 months. Storage conditions: $<40^{\circ}\text{C}$. Relative humidity: $<90\%\text{R.H.}$
 - 5-2. Module apart packing after 168 hours, to launch patch need to bake, to remove the module hygroscopic. Baking temperature conditions: 50°C , 72 hours.
 - 5-3. The actual number of module reel packing which is based on the actual number of packages to the customer requirements.

FCC Statement

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Please notice that 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 FCC ID: 2AC23- DT2H" any similar wording that expresses the same meaning may be used.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The module is limited to OEM installation ONLY.
The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application.
A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.
There is requirement that the grantee provide guidance to the host manufacturer for compliance with Part 15B requirements.
The module complies with FCC Part 15.247 / Part 15.407 and apply for Single module approval.
Trace antenna designs: Not applicable.

The end user manual shall include all required regulatory information/warning as shown in this manual, include:
This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

Antennas:

2.4G Wi-Fi GAIN	5G Wi-Fi GAIN
Metal antenna & 1.72 dBi	Metal antenna & 2.57 dBi

BT Antenna:

BRADE	TYPE	GAIN
GSD	PCB antenna	1.08 dBi

The antenna is permanently attached, can't be replaced.