

HK NATER TECH LIMITED

RL-SM02B-8189ETV Specification

Customer: _____

Description: RL-SM02B-8189ETV-V1.0

Customer P/N: _____

Date: _____

Customer		
Approve	Auditing	Admit

Provider		
Approve	Auditing	Admit

Customer:

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SDIO PRODUCT SPECIFICATION

IEEE 802.11 b/g/n 2.4GHz 1T1R WiFi Module

**RL-SM02B (Realtek RTL8189ETV)
Single Module**

Version 1.0

General Description

The Realtek RTL8189ETV is a highly integrated single-chip 802.11n Wireless LAN (WLAN) network SDIO interface (SDIO 1.1/ 2.0/ 3.0 compliant) controller. It is a WLAN MAC, a 1T1R capable WLAN baseband, and WLAN RF in a single chip. The RTL8189ETV provides a complete solution for a high throughput performance integrated wireless LAN device.

The RTL8189ETV WLAN baseband implements Orthogonal Frequency Division Multiplexing (OFDM) with 1 transmit and 1 receive path and is compatible with the IEEE 802.11n specification. Features include one spatial stream transmission, short guard interval (GI) of 400ns, spatial spreading, and transmission over 20MHz and 40MHz bandwidth.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK) and OFDM baseband processing are included to support all IEEE 802.11b and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability, are available, and CCK provides support for legacy data rates, with long or short preamble. The high-speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, and 64QAM modulation of the individual subcarriers and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provide higher data rates of 54Mbps and 150Mbps for IEEE 802.11g and 802.11n OFDM respectively.

The RTL8189ETV WLAN Controller builds in an enhanced signal detector, an adaptive frequency domain equalizer, and a soft-decision Viterbi decoder to alleviate severe multi-path effects and mutual interference in the reception of multiple streams. Robust interference detection and suppression are provided to protect against Bluetooth, cordless phone, and microwave oven interference.

Efficient IQ-imbalance, DC offset, phase noise, frequency offset, and timing offset compensations are provided for the radio frequency front-end. Selectable digital transmit and receive FIR filters are provided to meet transmit spectrum mask requirements and to reject adjacent channel interference, respectively.

The RTL8189 ETV WLAN Controller supports fast receiver Automatic Gain Control (AGC) with synchronous and asynchronous control loops among antennas, antenna diversity functions, and adaptive transmit power control function to obtain the better performance in the analog portions of the transceiver.

The RTL8189 ETV WLAN MAC supports 802.11e for multimedia applications, 802.11i for security, and 802.11n for enhanced MAC protocol efficiency. Using packet aggregation techniques such as A-MPDU with BA and A-MSDU, protocol efficiency is significantly improved. Power saving mechanisms such as Legacy Power Save, and U-APSD, reduce the power wasted during idle time, and compensates for the extra power required to transmit OFDM. The RTL8189ETV provides simple legacy and 20MHz/40MHz co-existence mechanisms to ensure backward and network compatibility.

2.Features

General

- ☐ CMOS MAC, Baseband PHY, and RF in a single chip for IEEE 802.11b/g/n compatible WLAN
- ☐ Complete 802.11n solution for 2.4GHz band
- ☐ 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- ☐ 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- ☐ Compatible with 802.11n specification
- ☐ Backward compatible with 802.11b/g devices while operating in 802.11n mode

Host Interface

- ☐ Complies with SDIO 1.1/ 2.0/ 3.0 for WLAN with clock rate up to 100MHz
- ☐ GSPI interface for configurable endian for WLAN

Standards Supported

- ☐ IEEE 802.11b/g/n compatible WLAN
- ☐ IEEE 802.11e QoS Enhancement (WMM)
- ☐ 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services
- ☐ Selectable receiver FIR filters
- ☐ Programmable scaling in transmitter and receiver to trade quantization noise against increased probability of clipping
- ☐ Fast receiver Automatic Gain Control (AGC)

WLAN MAC Features

- ☐ Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- ☐ Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
- ☐ PHY-level spoofing to enhance legacy compatibility
- ☐ Power saving mechanism
- ☐ Channel management and co-existence
- ☐ Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth

WLAN PHY Features

- ☐ IEEE 802.11n OFDM
- ☐ One Transmit and one Receive path (1T1R)
- ☐ 20MHz and 40MHz bandwidth transmission
- ☐ Short Guard Interval (400ns)
- ☐ DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- ☐ OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation.
Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- ☐ Maximum data rate 54Mbps in 802.11g and 150Mbps in 802.11n
- ☐ Switch diversity for DSSS/CCK
- ☐ Hardware antenna diversity in per packet base
- ☐ On-chip ADC and DAC

Peripheral Interfaces

- ☐ General Purpose Input/Output (8 pins)
- ☐ One configurable LED pins

PRODUCT SPECIFICATIONS

Main chipset

WiFi Single Chip: Realtek RTL8189 ETV

Functional Specifications

Standards	WiFi: IEEE 802.11b, IEEE 802.11g, Draft IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
Bus Interface	WiFi: GSPI/SDIO
Form Factor	L*W*H = 14mm*12.5mm*1.6mm +-0.2mm
Data Rate	802.11b: 11, 5.5, 2, 1 Mbps
	802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
	802.11n: MCS 0 to 7 for HT20MHz; MCS 0 to 7 for HT40MHz
Media Access Control	CSMA/CA with ACK
Modulation Techniques	802.11b: CCK, DQPSK, DBPSK
	802.11g: 64 QAM, 16 QAM, QPSK, BPSK
	802.11n: 64 QAM, 16 QAM, QPSK, BPSK
Network Architecture	Ad-hoc mode (Peer-to-Peer)
Operating Channel	11: (Ch. 1-11) – United States
	13: (Ch. 1-13) – Europe
	14: (Ch. 1-14) – Japan
Frequency Range	2.400GHz ~ 2.4835 GHz
Security	WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE802.11x, IEEE 802.11i
Operating Voltage	3.3 V
OS supported	Windows XP/Win7/Linux/Android

Electrical Specifications

1) DC Characteristics

Module	Voltage	Current Consumption (linking)
RL-SM02B-8189ETV-V1.0	3.3V	120mA (上网或者看电影时的功耗)

2) RF Characteristics for IEEE802.11b (11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	CCK 11 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤85 dBm@8%)	-85 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (17±2 dBm)		17		dBm
EVM (≤-18)		-18		dB

3) RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM 54 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤70 dBm@10%)	-70 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (14±2dBm)		14		dBm
EVM (≤-28)		-28		dB

4) RF Characteristics for IEEE802.11n (BW20_MCS7)

Items	Contents			
Specification	IEEE802.11n (BW20_MCS7)			
Mode	OFDM 65 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤65 dBm@10%)	-65 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (13±2 dBm)		13		dBm
EVM (≤-28)		-28		dB

5) RF Characteristics for IEEE802.11n (BW40_MCS7)

Items	Contents			
Specification	IEEE802.11n (BW40_MCS7)			
Mode	OFDM 135 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤65 dBm@10%)	-65 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (13±2 dBm)		13		dBm
EVM (≤-28)		-28		dB

Mechanical

Dimensions (mm)	Length	Width	Height
	14 (Tolerance:±0.2mm)	12.5 (Tolerance:±0.2mm)	1.8 (Tolerance:±0.2mm)

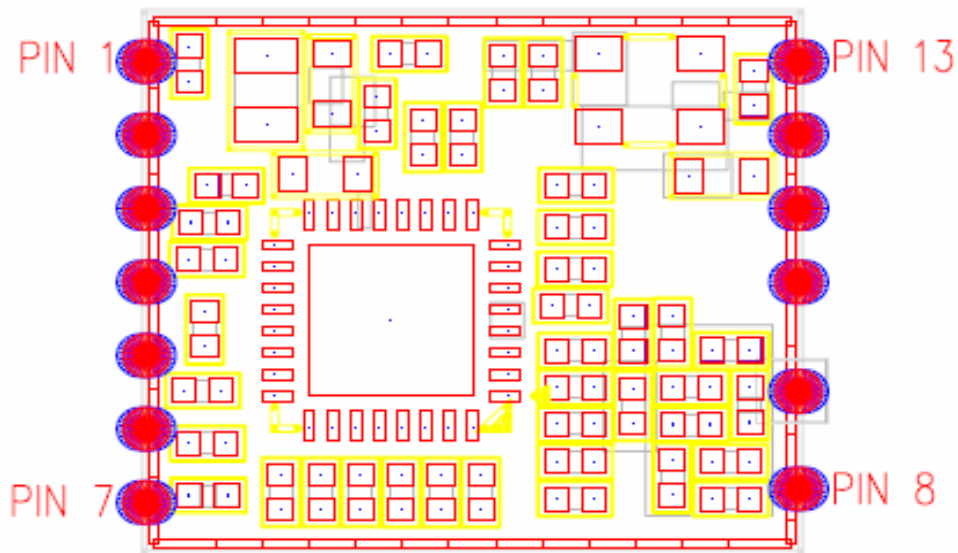


Fig.1 Top Layer (Top View)

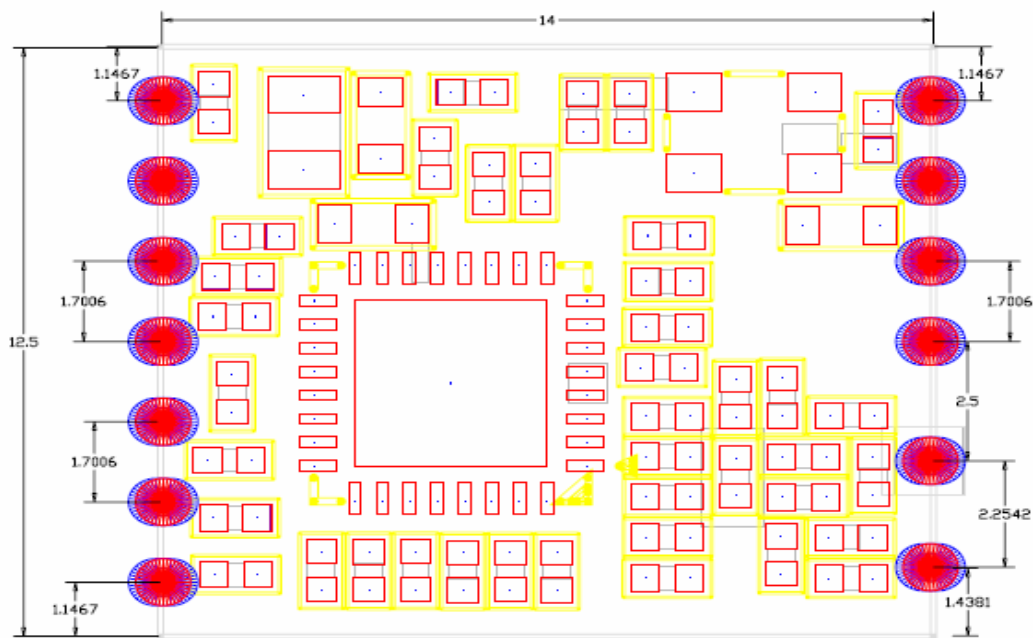


Fig.2 Size chart (Top View)

Block Diagram

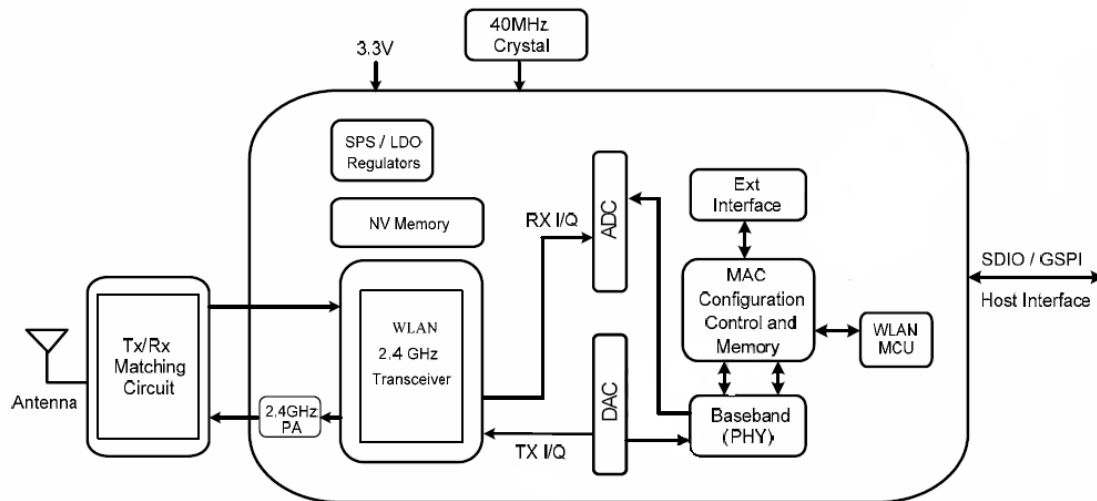
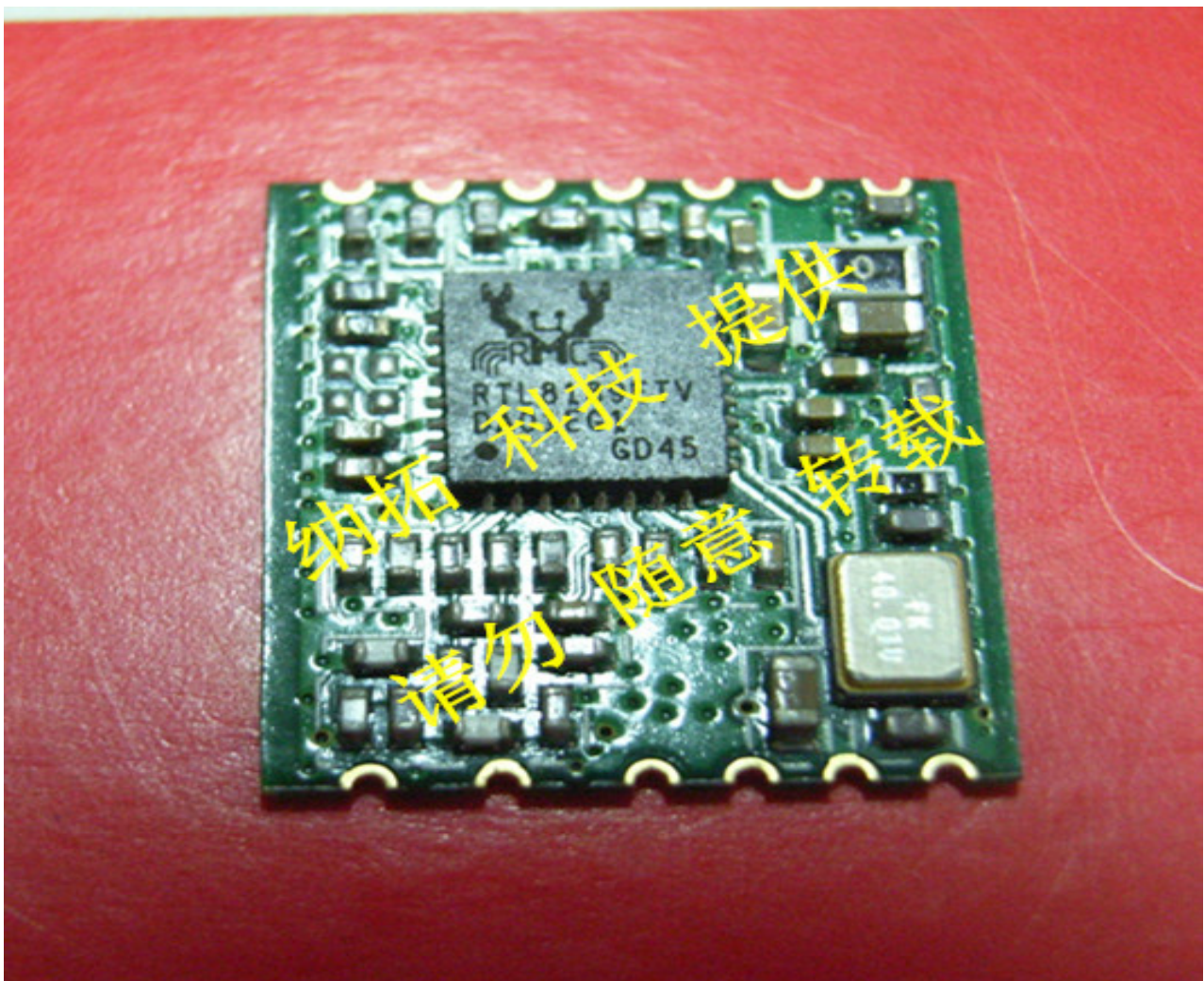


Figure 1. Single-Band 11n (1x1) Solution

Default this module only require 3.3V single power source and core voltage generated by internal voltage regulator.

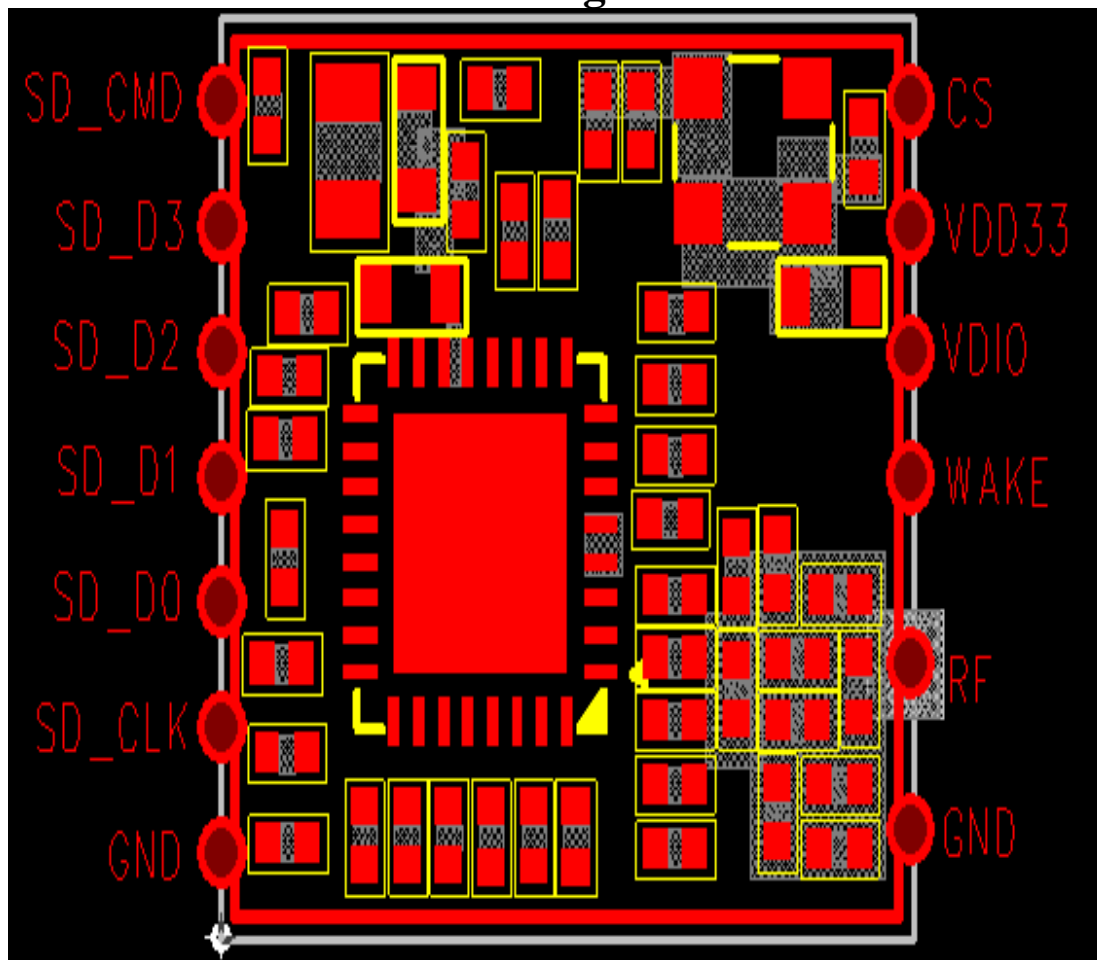
MODULE Picture



MODULE PIN Name

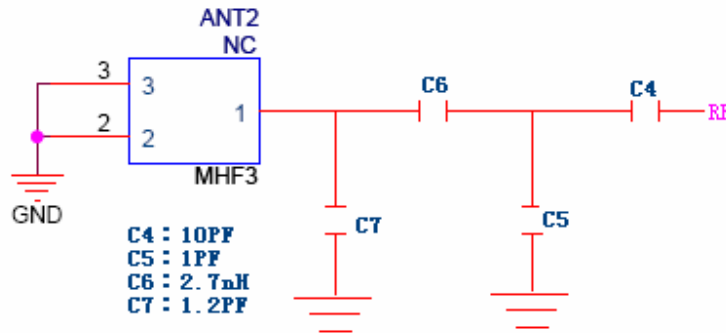
Pin	Function	Pin	Function
1	SD_CMD	8	GND
2	SD_D3	9	RF
3	SD_D2	10	WAKE
4	SD_D1	11	VDIO VDD for SDIO Pin, the power supply is same as the signal level of SDIO bus (3.3V ~ 1.8V)
5	SD_D0	12	VDD33
6	SD_CLK	13	CS
7	GND		

Module PIN feet definition figure



WIFI\BT RF Circuit reference pictures

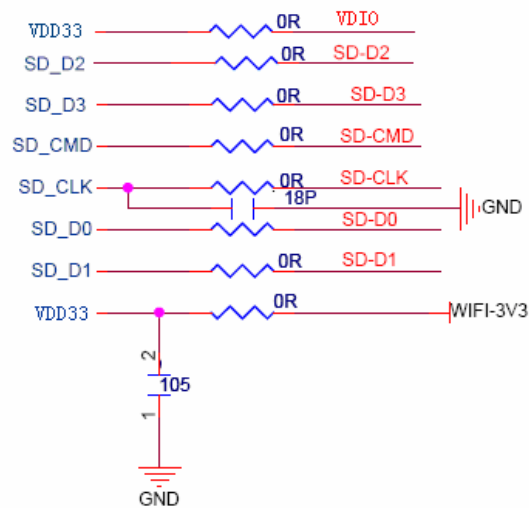
WIFI\BT RF电路参考图



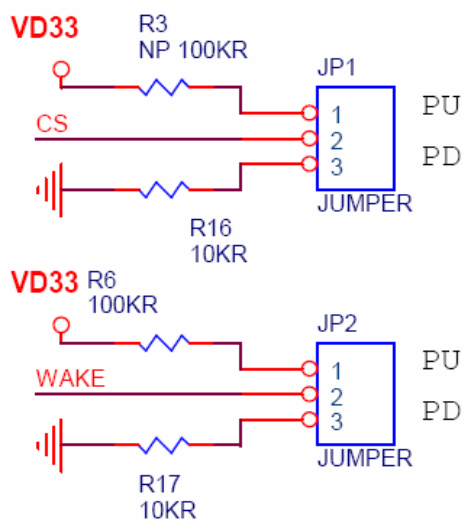
注：以上 RF 走线要做 50 欧的阻抗，走线不能走 90 度，单走线不能长于 15MM。

SDIO interface Circuit reference pictures

SDIO接口电路参考图



CS WAKE Reference circuits



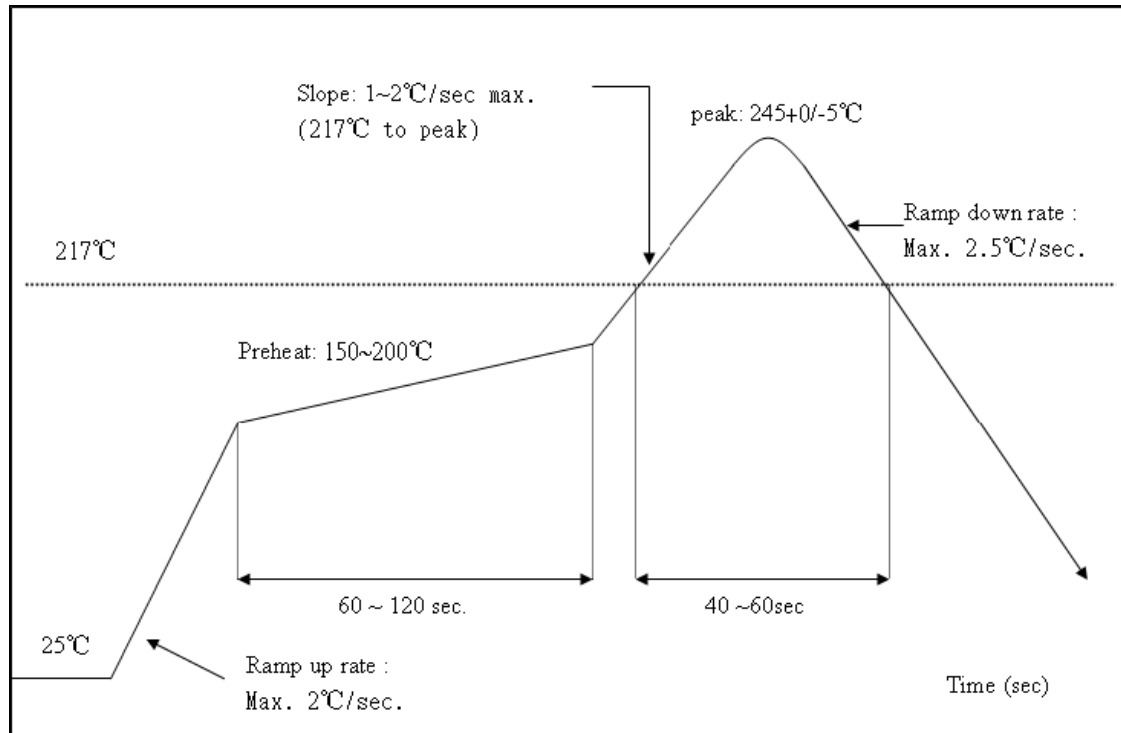
CS, WAKE config.

Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



ID SETTING INFORMATION

Reg Domain	World Wide 13 Channels 1-11 with active scan Channels 12,13 with passive scan Channel 14 with no scan
Reg Domain Code	0x0A
Vendor ID	WiFi :0x024C
Device ID	WiFi :0x8179
Subsystem Device ID	0x8179 (Realtek demoboard)
Subsystem Vendor ID	0x024C

ENVIRONMENTAL

Operating

Operating Temperature: 0°C to +70 °C
Relative Humidity: 5-90% (non-condensing)

Storage

Temperature: -40°C to +80°C (non-operating)
Relevant Humidity: 5-95% (non-condensing)

MTBF caculation

Over 150,000hours