PRODUCTS SPECIFICATION

1. General Description

This document is to specify the product requirements for 802.11a/b/g/n/ac and Bluetooth USB Module. This Card is based on Qualcomm QCA9378-7 chipset .It is WLAN and BT combo solution to support a complete 2×2 MIMO dual-band(2.4GHz and 5GHz) 802.11a/b/g/n/ac WLAN and BT 4.1+HS.This module provides a high level of integration with a dual-stream IEEE 802.11ac MAC/baseband/radio and Bluetooth 4.1+HS and Low Energy technology.

The WLAN operation supports rates of MCS0 ~ MCS9 (up to 256QAM) in 20MHz,40MHz and 80MHz channels for data rates up to 866.7Mbps. It is also backward complied with IEEE 802.11a standard from 5.15~5.25 and 5725~5.825GHz wideband and IEEE 802.11b/g standard from 2.4~2.4835GHz. It can be used to provide up to 54Mbps for IEEE 802.11a and IEEE 802.11g, 11Mbps for IEEE 802.11b and 300Mbps for IEEE 802.11n.

With seamless roaming, fully interoperability and advanced security with WEP standard, 802.11 a/b/g/n/ac USB2.0 Module offers absolute interoperability with different vendors 802.11a/b/g/n/ac.Access Points through the wireless LAN.

The device shall automatically discontinue transmission in cases of absence of information to transmit, or operational failure. Then it will scan the available radio signals. If this signal is connected before, it will be automatically connected, otherwise manual connections will be necessary.

Note: The WLAN and BT are time-division working mode, simultaneous transmission is not supported.

2. Features

- Compatible with IEEE 802.11b standard to provide wireless 11Mbps date rate.
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps date rate.
- Compatible with IEEE 802.11a standard to provide wireless 54Mbps date rate.
- Compatible with IEEE 802.11n standard to provide wireless 300Mbps date rate.
- Compatible with IEEE 802.11ac standard to provide wireless 866.7Mbps date rate.
- Highly integrated WLAN SoC(system-on-chip) for 5 GHz 802.11ac,or2.4/5 GHz 802.11n WLAN applications
- Supports Bluetooth V4.1+HS, BLE and be backwards compatible with BT 1.X, 2.X+Enhanced Data Rate.
- Bluetooth Class 1 or Class 2 transmitter operation.
- Supports external PA and LNA with control logics.
- Operation at 2.4~2.483.5GHz, 5.15~5.25 and 5725~5.825GHz frequency band to meet worldwide regulations.
- Provides simple legacy and 20MHz/40MHz/80MHz co-existence mechanisms to ensure backward and network compatibility.
- Friendly user configuration and diagnostic utilities
- Drivers support Windows7.LINUX
- High speed USB 2.0 interface for WLAN and USB1.1 for BT.
- RoHS compliant

3. Application Diagrams

3.1 General Requirements

3.1.1 IEEE 802.11b Section

#	Feature	Detailed Description
3.1.1.1	Standard	● IEEE 802.11b
3.1.1.2	Radio and Modulation Schemes	● CCK (DQPSK , DBPSK , DSSS)
3.1.1.3	Operating Frequency	● 2400 ～ 2483.5MHz ISM band
3.1.1.4	Channel Numbers	● 11 channels for United States
3.1.1.5	Data Rate	● 11,5.5,2,and 1Mbps
3.1.1.6	Media Access Protocol	● CSMA/CA with ACK
3.1.1.7	Transmitter Output Power at Antenna Connector	● Typical RF Output Power at each RF chain, Data Rate and at room Temp. 25 degree C ● 17dBm(±2dB) at 1,2,5.5,11Mbps
3.1.1.8	Receiver Sensitivity at Antenna Connector	● Typical Sensitivity at Which Frame(1000-byte PDUs)Error Rate=8% ● -98 dBm at 1Mbps ● -89 dBm for 11Mbps

3.1.2 IEEE 802.11g Section

#	Feature	Detailed Description
3.1.2.1	Standard	● IEEE 802.11g
3.1.2.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM with OFDM
3.1.2.3	Operating Frequency	● 2400 ～ 2483.5MHz ISM band
3.1.2.4	Channel Numbers	● 11 channels for United States
3.1.2.5	Data Rate	● 6,9,12,18,24,36,48,54Mbps
3.1.2.6	Media Access Protocol	● CSMA/CA with ACK
3.1.2.7	Transmitter Output Power at Antenna Connector	● Typical RF Output Power(tolerance±2dB) at each RF chain, Data Rate and at roomTemp. 25 degree C ● 17 dBm at 6,9Mbps ● 16 dBm at 12,18Mbps ● 15 dBm at 24,36Mbps ● 14 dBm at 48,54Mbps

3.1.3 IEEE 802.11a Section

#	Feature	Detailed Description
3.1.3.1	Standard	● IEEE 802.11a
3.1.3.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM with OFDM
3.1.3.3	Operating Frequency	● 5.15~5.25GHz and 5.725~5.825GHz for US
3.1.3.4	Data Rate	● 6,9,12,18,24,36,48,54Mbps
3.1.3.5	Media Access Protocol	● CSMA/CA with ACK
3.1.3.6	Transmitter Output Power at Antenna Connector	● Typical RF Output Power(tolerance±2dB) at each RF chain, Data Rate and at roomTemp. 25 degree C ● 14 dBm at 6,9Mbps ● 13 dBm at 12,18Mbps ● 12 dBm at 24,36Mbps ● 11 dBm at 48,54Mbps

3.1.4 IEEE 802.11n Section

#	Feature	Detailed Description				
3.1.4.1	Standard	● IEEE 802.11n				
3.1.4.2	Radio and Modulation Type	● BPSK , QPSK , 16QAM ,64QAM with OFDM				
3.1.4.3	Operating Frequency	● 2.4GHz band:2400 ~ 2483.5MHz ● 5GHz band: 5.15~5.25GHz and 5.725~5.825GHz				
3.1.4.4	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
3.1.4.5	Media Access Protocol	● CSMA/CA with ACK				
3.1.4.6	Transmitter Output Power at Antenna Connector	● Typical RF Output Power (tolerance±2dB) at each RF chain, Data Rate and at roomTemp. 25 degree C				
		● 2.4GHz Band/HT20 +14dBm at MCS0~15			● 2.4GHz Band/HT40 +14dBm at MCS0~15	
		● 5GHz Band/HT20 +11dBm at MCS0~15			● 5GHz Band/HT40 +10dBm at MCS0~15	

3.1.5 IEEE 802.11ac Section

#	Feature	Detailed Description
3.1.5.1	Standard	● IEEE 802.11ac
3.1.5.2	Radio and Modulation Type	● QPSK , BPSK , 16QAM ,64QAM,256QAM with OFDM
3.1.5.3	Operating Frequency	● 5.15~5.25GHz and 5.725~5.825GHz for US
3.1.5.4	Data Rate	● at most 866 Mbps
3.1.5.5	Media Access Protocol	● CSMA/CA with ACK
3.1.5.6	Transmitter Output Power at Antenna Connector	● Typical RF Output Power(tolerance±2dB) at each RF chain, Data Rate and at roomTemp. 25degree C ● +9 dBm at HT20/HT40/HT80

3.1.6 Bluetooth Section

Feature	Description
General Specification	
Bluetooth Standard	Bluetooth V4.1 of 1, 2 and 3 Mbps
Modulation	FHSS, GFSK, π/4DQPSK, 8DPSK
Frequency Band	2.400 GHz ~ 2.4835 GHz
Number of Channels	79 channels
Channel Separation	1 MHz
Antenna Type:	PIFA Antenna
Antenna Reference:	Small antennas with 1.72 dBi peak gain
Transmitter Output Power at Antenna Connector (Class 1.5):	10 dBm (tolerance±2dB)

3.1.7 Bluetooth Low Energy

Feature	Description
General Specification	
Bluetooth Standard	Bluetooth V4.1 of Low Energy
Modulation	GFSK
Frequency Band	2.400 GHz ~ 2.4835 GHz
Number of Channels	40 channels
Channel Separation	2 MHz
Antenna Type:	PIFA Antenna
Antenna Reference:	Small antennas with 1.72 dBi peak gain
Transmitter Output Power at Antenna Connector:	0 dBm (tolerance±2dB)

4. Electrical and Thermal Characteristics

4.1 Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-40	+80	℃
Ambient Operating Temperature	0	60	℃
Junction Temperature	0	125	℃

4.2 General Section

	Feature	Detailed Description
5.2.1	Antenna Type	● External antenna
5.2.2	Operating Voltage	● 3.3V±10%
5.2.3	Current Consumption	● ＜1200mA
5.2.4	Form Factor and Interface	● High Speed USB2.0 Interface(WLAN) ● USB1.1 Interface(BT)

4.2.1 Current Describtion

Description	Typical	Unit
IDLE(WiFi Sleep)	10	mA
2G/2T-HT40 MCS15(14dBm)	360	mA
2G/2T-HT20 MCS15(14dBm)	410	mA
2G/1T-G OFMD54M(17dBm)	250	mA
2G/1T-B CCK11M(17Bm)	330	mA
5G/2T-AC HT80 MCS9(9dBm)	510	mA
5G/2T- HT40 MCS15(10dBm)	580	mA
5G/2T- HT20 MCS15(11dBm)	610	mA
5G/1T- A OFDM54M(14dBm)	490	mA
2G/2R-HT40 MCS15(-60dBm)	120	mA
2G/2R-HT20 MCS15(-60dBm)	120	mA
2G/1R- G OFDM54M (-60dBm)	110	mA
2G/1R- B CCK11M(-60Bm)	110	mA
5G/2R-HT80 MCS9(-60dBm)	150	mA
5G/2R-HT40 MCS15(-60dBm)	130	mA
5G/2R-HT20 MCS15(-60dBm)	130	mA
5G/1R- G OFDM54M (-60dBm)	120	mA

4.3 Software

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

4.4 Mechanical Dimensions

	Feature	Detailed Description
4.4.1	Length	● 27mm
4.4.2	Width	● 18mm
4.4.3	Height	● 1.0mm(PCB)

PRODUCTS SPECIFICATION

4.5 Mechanical Dimensions

TOP VIEW   BOTTOM VIEW   PCB LAYOUT
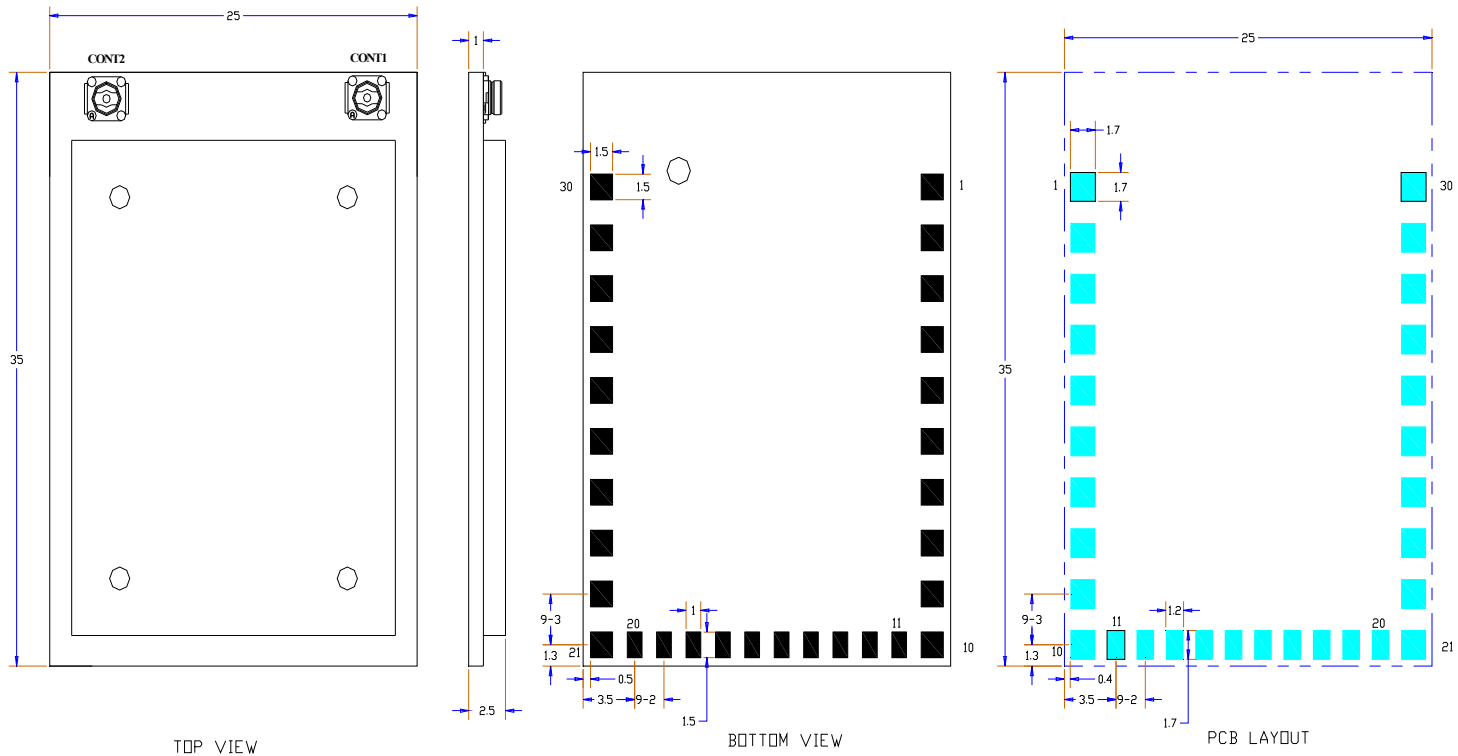
TOLERANCES ARE +/-0.3mm UNLESS OTHERWISE SPECIFIED
* UNITE :mm

Pin	Symbol	I/O	Description	Function
1	GND		GROUND	
2	GND		GROUND	
3	GND		GROUND	
4	VDD(+3.3V)	I	POWER SUPPLY 3.3V	
5	GND		GROUND	
6	GND		GROUND	
7	BT_HOST_WAKE	O	BT WAKE UP HOST	External pull up or down decided by FW
8	BT_DEV_WAKE	I	HOST WAKE UP BT	External pull up or down decided by FW
9	NC		NO CONNECTION	
10	GND		GROUND	
11	USB_DN	I/O	USB D-	
12	USB_DP	I/O	USB D+	
13	GND		GROUND	
14	GND		GROUND	
15	BT_REG_ON	I	BT ON	Internal pull up to 3.3V
16	WL_REG_ON	I	WL ON	Internal pull up to 3.3V
17	WL_HOST_WAKE	O	WL WAKE UP HOST	External pull up or

				down decided by FW
18	WL_DEV_WAKE	I	HOST WAKE UP WL	External pull up or down decided by FW
19	GND		GROUND	
20	VDD(+3.3V)	I	POWER SUPPLY 3.3V	
21	GND		GROUND	
22	GND		GROUND	
23	GND		GROUND	
24	GND		GROUND	
25	GND		GROUND	
26	GND		GROUND	
27	GND		GROUND	
28	GND		GROUND	
29	GND		GROUND	
30	GND		GROUND	
CONT1	CONNECTOR 1	I/O	BT/WIFI CONNECTOR	FOR EXTERNAL ANT
CONT2	CONNECTOR 2	I/O	WIFI CONNECTOR	FOR EXTERNAL ANT

4.6 Reflow
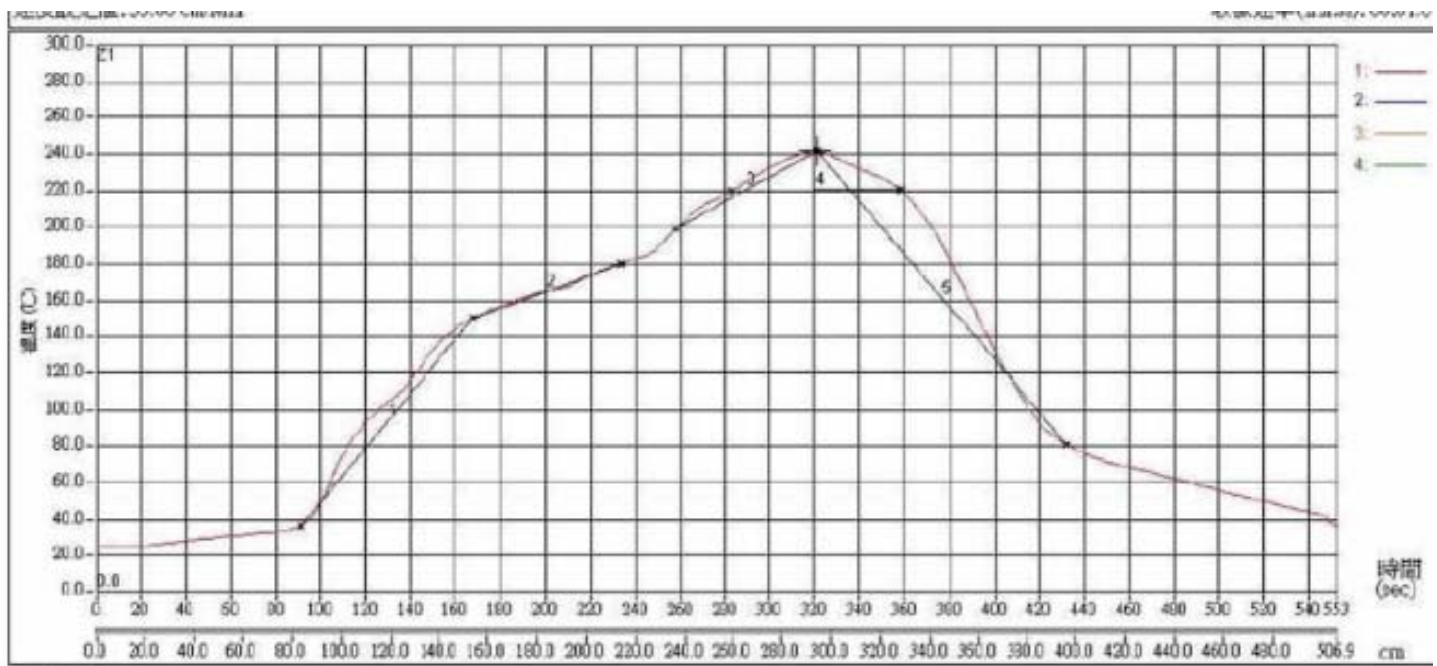
~ 150 ℃ < 2 ℃/s	150 ~ 180 ℃ 55 ~ 65 sec	200℃ ~ peak < 1 ℃/s	above 220℃ 65 ~ 75 sec	Peak Temp. 235~245 ℃

5.　Antenna specification

For 2400 MHz to 2483.5 MHz		
Antenna Type:	Chain 0	PIFA Antenna
	Chain 1	PIFA Antenna
Max. Antenna Gain:	Chain 0	1.72 dBi
	Chain 1	1.72 dBi
Directional gain:	4.73 dBi Note: For MIMO mode (2Tx/2Rx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The transmit signals are correlated with each other.	

For 5150 MHz to 5850 MHz		
Antenna Type:	Chain 0	PIFA Antenna
	Chain 1	PIFA Antenna
Max. Antenna Gain:	Chain 0	2.57 dBi
	Chain 1	2.57 dBi
Max. Directional gain:	5.58 dBi Note: For MIMO mode (2Tx/2Rx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The transmit signals are correlated with each other.	