ART6212 Datasheet

Amp'ed RF Technology, Inc.

ART6212 Product Specification

PRELIMINARY

12 mm x 12 mm x 2.4 mm

Description

Amp'ed RF Tech presents the ART621 Wi-Fi & BLE combo module: 802.11abgn/BLEv4.1. The ART6212 is a small footprint low cost RF module intended to help customers shorten product development cycles and reduce cost.

Fully compatible with our AmpedUP embedded protocol stack, the ART6212 may be matched with many Host MCU chipsets. Additionally, Linux and Android OS drivers are available.

The ART6212 is offered in WiFi/BLE combo, WiFi only, and BLE only configurations.

Features

WLAN

- 802.11a/b/g/n, 802.11d, 802.11r

- Dual Band: 2.4GHz and 5GHz

- Output Power, +21.5dBm

- Interface, SDIO 2.0, SPI

- Wi-Fi Direct (concurrent)

- Wi-Fi Protected Setup

- Soft Access Point

- Hotspot 2.0

- Security: WPA1/WPA2, AES, WEP

Bluetooth

- Bluetooth BLE 4.1

Hardware

- Serial interfaces: UART, SDIO

- RoHS conformance

Contents

1. Hardware Specifications

General Conditions (VIN= 3.6V and 25°C)

1.1. Recommended Operating Conditions

Rating	Min	Typical	Max	Unit
Operating Temperature Range	-40	-	85	°C
Supply Voltage V_{IN}	2.3	3.6	4.8	Volts
Supply Voltage V_{VDDIO}	1.7	3.3	3.6	Volts
Signal Pin Voltage	-	0.7 V_{VDDIO} ~ V_{VDDIO}	-	Volts
RF Frequency	2400	-	2483.5	MHz

1.2. Absolute Maximum Ratings

Rating	Min	Typical	Max	Unit
Storage temperature range	-55	-	+150	°C
Supply voltage V_{IN}	-0.3	-	+5.0	Volts
I/O pin voltage V_{IO}	-0.3	-	+3.6	Volts
RF input power	-	-	-5	dBm

1.3. Current Consumption

Modes (WLAN Max Power Consumption) V_{BAT}=3.6v	Avg	Unit
Complete Power Down (WL_REG_ON low)	17	µA
Sleep	101	µA
Power save (beacon period including DTIM 100ms, beacon length 1ms) -proprietary power saving features enabled	0.77	mA
RX (idle, 2.4GHz)	64.07	mA
RX (active, 2.4GHz, OFDM)	67.87	mA
TX (active, 2.4GHz, OFDM), 15.5dBm @RF port	242.67	mA
TX (active, 2.4GHz, OFDM), 20.5dBm @RF port	338.67	mA
TX (active, 2.4GHz, OFDM), 19.0dBm @RF port	285.67	mA
A VoIP call using a standard codec G.711 (64Kb/s, 320 byte packets) and U-APSD (WMM power save) power-saving mode.	4.65	mA
Video streaming; the device is receiving 2.0 Mbps of data using legacy PSM mode (for example, MPEG-4@2Mbps)	13.31	mA
Ipeak: system maximum peak current draw	378	mA

Modes (Bluetooth Typical Power Consumption)	Avg	Unit
System reset mode	0.1	µA
System deep sleep mode	TBD	µA
Advertising (nonconnectable) (Interval: 1.28s;Data:15; bytes 3 channels)	TBD	µA
Advertising (discoverable) (Interval: 1.28 s;Data: 15 bytes;3 channels)	TBD	µA
Scanning (Interval: 1.28 s;Window: 11.25 ms;Single frequency per window)	TBD	µA

1.4. Selected RF Characteristics

Parameters	Conditions	Typical	Unit
Antenna load		50	ohm
Wi-Fi Receiver			
Sensitivity	DSSS 1Mbps@FER<8%	-98	dBm
Sensitivity	DSSS 2Mbps@FER<8%	-95	dBm
Sensitivity	CCK 5.5Mbps@FER<8%	-93	dBm
Sensitivity	CCK 11Mbps@FER<8%	-91	dBm
Sensitivity	BPSK 6Mbps@PER<10%	-93.5	dBm
Sensitivity	BPSK 9Mbps@PER<10%	-91.5	dBm
Sensitivity	QPSK 12Mbps@PER<10%	-90.5	dBm
Sensitivity	QPSK 18Mbps@PER<10%	-88	dBm
Sensitivity	16QAM 24Mbps@PER<10%	-85	dBm
Sensitivity	16QAM 36Mbps@PER<10%	-82	dBm
Sensitivity	64QAM 48Mbps@PER<10%	-78	dBm
Sensitivity	64QAM 54Mbps@PER<10%	-76.5	dBm
Sensitivity	BPSK 6.5Mbps@PER<10%	-92	dBm
Sensitivity	QPSK 13Mbps@PER<10%	-89	dBm
Sensitivity	QPSK 19.5Mbps@PER<10%	-86.5	dBm
Sensitivity	16QAM 26Mbps@PER<10%	-84	dBm
Sensitivity	16 QAM 39Mbps@PER<10%	-80.5	dBm
Sensitivity	64QAM 52Mbps@PER<10%	-76.5	dBm
Sensitivity	64QAM 58.5Mbps@PER<10%	-74.5	dBm
Sensitivity	64QAM 65Mbps@PER<10%	-73	dBm
Wi-Fi Receiver 5GHz 11n			
Sensitivity	BPSK 6.5Mbps@PER<10%,Nss=1	-91	dBm
Sensitivity	QPSK 13Mbps@PER<10%, Nss=1	-88	dBm
Sensitivity	16QAM 26MbpsPER<10%,Nss=1	-83	dBm
Sensitivity	64QAM 65MbpsPER<10%,Nss=1	-72.5	dBm
Wi-Fi Transmitter			
Output Power	802.11b@ch1	8	dBm
Output Power	802.11g @ch1	17.5	dBm
Output Power	802.11n @ch1	17	dBm
Wi-Fi Transmitter 5GHz, 11n			

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Output Power	802.11a @ch36	19	dBm
Output Power	802.11n @ch36	16	dBm
Bluetooth Transmitter			
Frequency range		2400~2483.5	MHz
Maximum output power		2	dBm
Minimum output power		-21	dBm
Minimum output power in advertising mode		TBD	dBm
Output power accuracy		TBD	dB
Bluetooth Receiver			
Receiver sensitivity (clean transmitter)	BER < .001	-93	dBm
Receiver sensitivity (dirty transmitter)	BER < .001	TBD	dBm

1.5. Pin Assignment ART6212

Name	Type	Pin #	Description	ALT Function	Typ Voltage
Power and Ground					
VIN		9	VIN		3.6v
GND		20	GND		
VIN_LDO_OUT		21	Internal Buck voltage generation pin		
VDDIO		22	I/O Voltage supply input		
VIN_LDO		23	Internal Buck voltage generation pin		
VDD_1V8		29	1.8V power supply input (optional)		1.8v
Control					
BT_RST_N	I	34	BT Reset input		3.3v
WL_REG_ON	I	12	Internal regulators power enable/disable		
BT_WAKE	I	6	HOST wake-up Bluetooth device		
BT_HOST_WAKE	O	7	Bluetooth device to wake-up HOST		
WL_HOST_WAKE	O	13	WLAN to wake-up HOST		
FEM_CTRL_1	I	39	Function control of antenna switch		
FEM_CTRL_2	I	40	Function control of antenna switch		
Clock					
LPO	I	24	low power clock 32.768KHz		3.3v
26M XTAL_IN	I	10	26MHz Crystal input		
26M XTAL_OUT	O	11	26MHz Crystal output		
32k XTAL_IN	I	37	32kHz Crystal input		
32k XTAL_OUT	O	38	32kHz Crystal output		
UART Interface					
RXD	I	42	Receive data		3.3v
TXD	O	43	Transmit data		3.3v
RTS	O	41	Request to send (active low)		3.3v
CTS	I	44	Clear to send (active low)		3.3v
Digital Interface					
SDIO [0]	I/O	16	SDIO CMD	SPI DI	3.3v
SDIO [1]	I/O	18	SDIO DATA0	SPI DO	3.3v
SDIO [2]	I/O	19	SDIO DATA1	SPI INT	3.3v

SDIO [3]	I/O	15	SDIO DATA3	SPI CSN	3.3v
SDIO [4]	I/O	17	SDIO CLK	SPI CLK	3.3v
SDIO [5]	I/O	14	SDIO DATA2		3.3v
SDIO INT	I	8	SDIO external interrupt		1.8v
5GHz Interface					
RF_IN_HB	I	4	5GHz RF input		
RF_OUT_HB	O	5	5GHz RF output		
External Antenna					
GND		1	GND		
WL_ANT		2	Antenna port for WIFI		
GND		3	GND		
GND		31	GND		
BLE ANT		32	Antenna port for BLE		
GND		33	GND		
GND		36	GND		
NC Pins					
NC		25	Floating (Do not connect to ground)		
NC		26	Floating (Do not connect to ground)		
NC		27	Floating (Do not connect to ground)		
NC		28	Floating (Do not connect to ground)		
NC		30	Floating (Do not connect to ground)		
NC		35	Floating (Do not connect to ground)		

1.6. Layout Drawing ART6212

Size: 12 mm x 12mm x 2.4 mm (height)

472.4mil
(12 mm)

59 mil
(1.5 mm)

59 mil
(1.5 mm)

59 mil
(1.5 mm)

472.4 mil
(12 mm)

TOP VIEW

44 CTS
43 TXD
42 RXD
41 RTS
40 FEM_CTRL_2
39 FEM_CTRL_1
38 32k XTAL_OUT
37 32k XTAL_IN
36 GND
35 NC
34 BT_RST_N

1 GND
2 Antenna port for WIFI
3 GND
4 RF_IN_HB
5 RF_OUT_HB
6 BT_WAKE
7 BT_HOST_WAKE
8 SDIO INT
9 VIN
10 26M XTAL_IN
11 26M XTAL_OUT

33 GND
32 Antenna port for BLE
31 GND
30 NC
29 VDD_1V8
28 NC
27 NC
26 NC
25 NC
24 LPO
23 VIN_LDO

35.4 mil
(0.9 mm)

20 mil
(0.5 mm)

12 WL_REG_ON
13 WL_HOST_WAKE
14 SDIO DATA2
15 SDIO DATA3
16 SDIO CMD
17 SDIO CLK
18 SDIO DATA0
19 SDIO DATA1
20 GND
21 VIN_LDO_OUT
22 VDDIO

2. Hardware Design

- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- Traces should not be routed underneath the module.

2.1. Module Reflow Installation

The ART6212 is a surface mount Bluetooth module supplied on a 44 pin, 6-layer PCB. The final assembly recommended reflow profiles are:

For RoHS/Pb-free applications, Sn96.5/Ag3.0/Cu0.5 solder is recommended.

- Maximum peak temperature of 230° - 240°C (below 250°C).
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum rise and fall slope after liquidous of < 3°C/second.
- Maximum time at liquidous of 40 – 80 seconds.

3. Reference Design Example ART6212

The follow circuits are examples of typical Linux based platform connections to the ART6212 module.
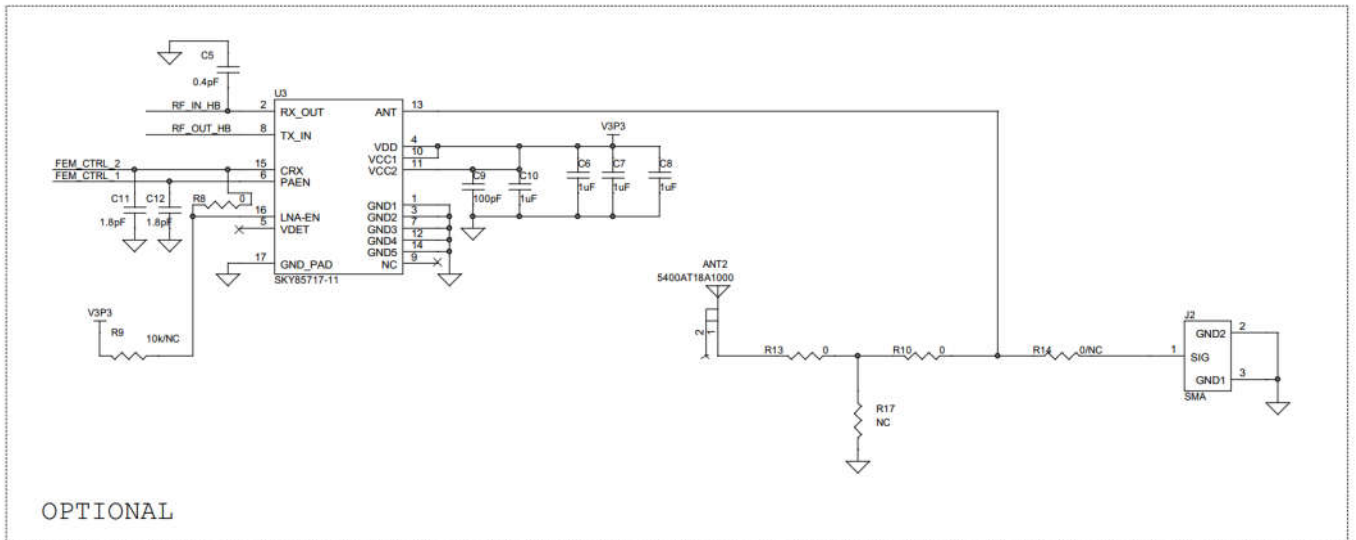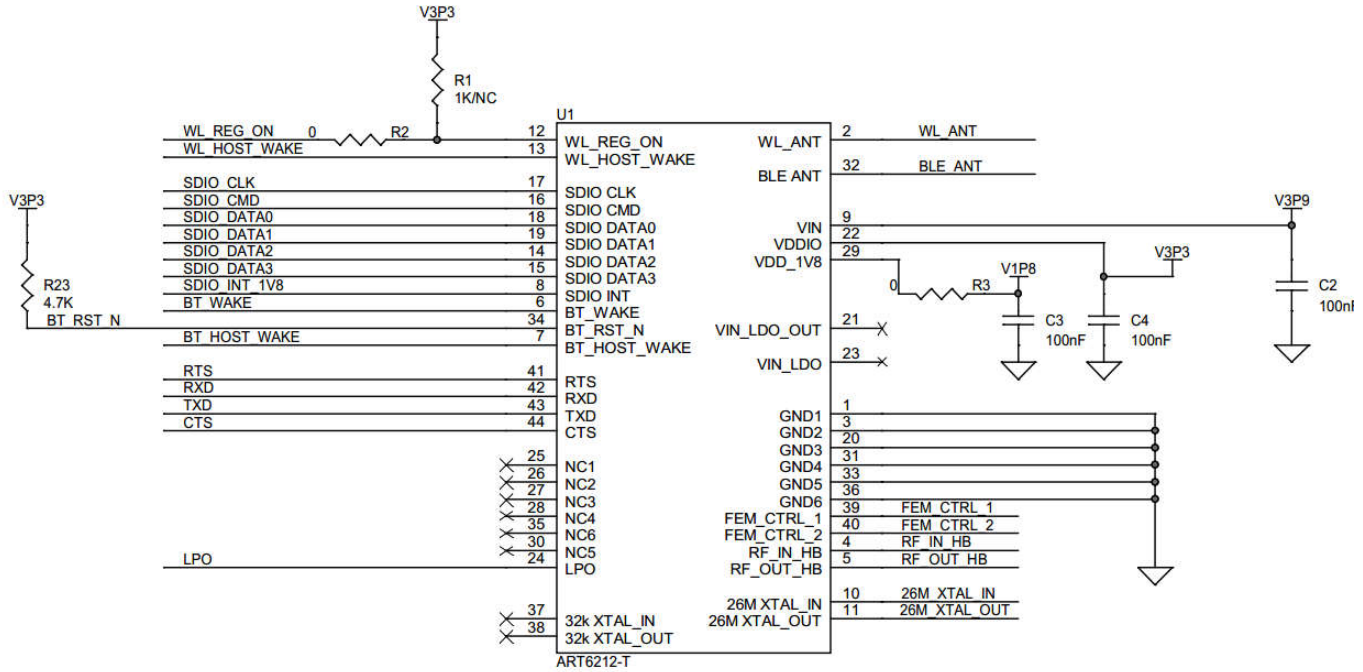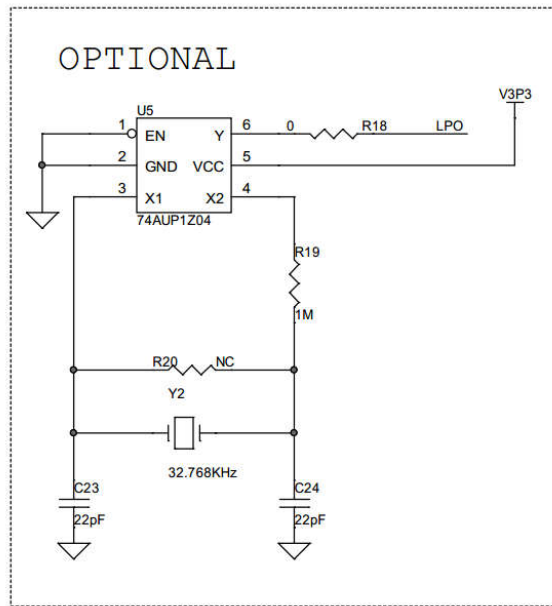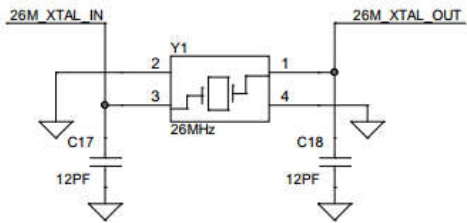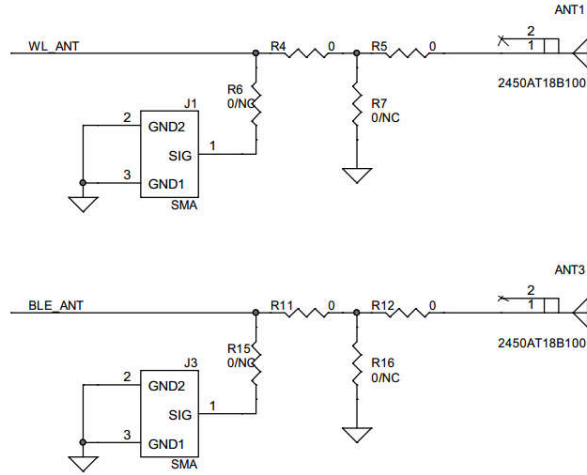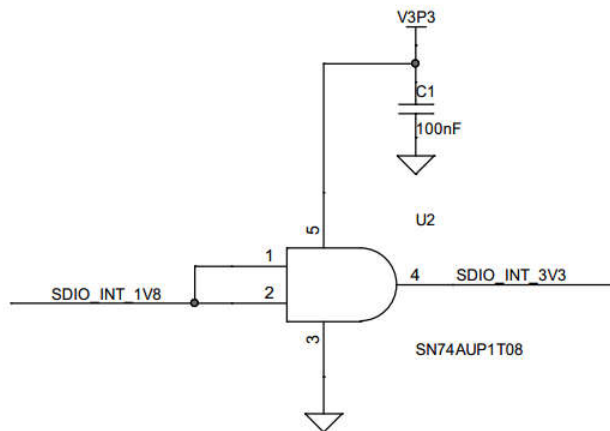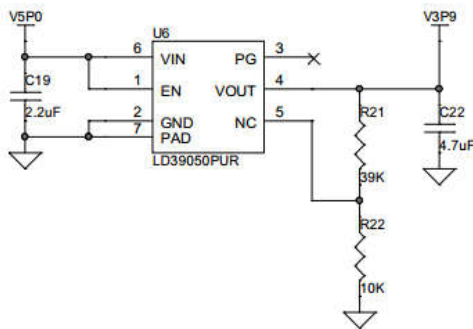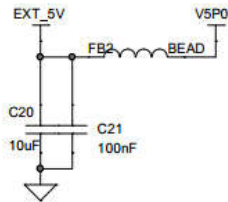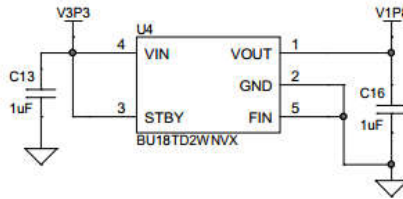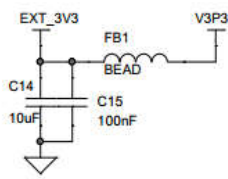
Note: It is better to use 9pF 26MHz crystal (Y1). The load capacitors (C17, C18) of crystal circuit is recommended to be 12pF or 15pF which is depended the design of the PCB layout traces. The capacitors ESR is better to be 0.1ohm at 100MHz. The traces from the crystal to the ART6212-T pads should be as short as possible.

The recommended 26MHz crystal PN is Q22FA1280002000 and it's soldered at the user's PCB board by the following condition:

Reflow condition (follow to IPC / JEDEC J-STD-020C)
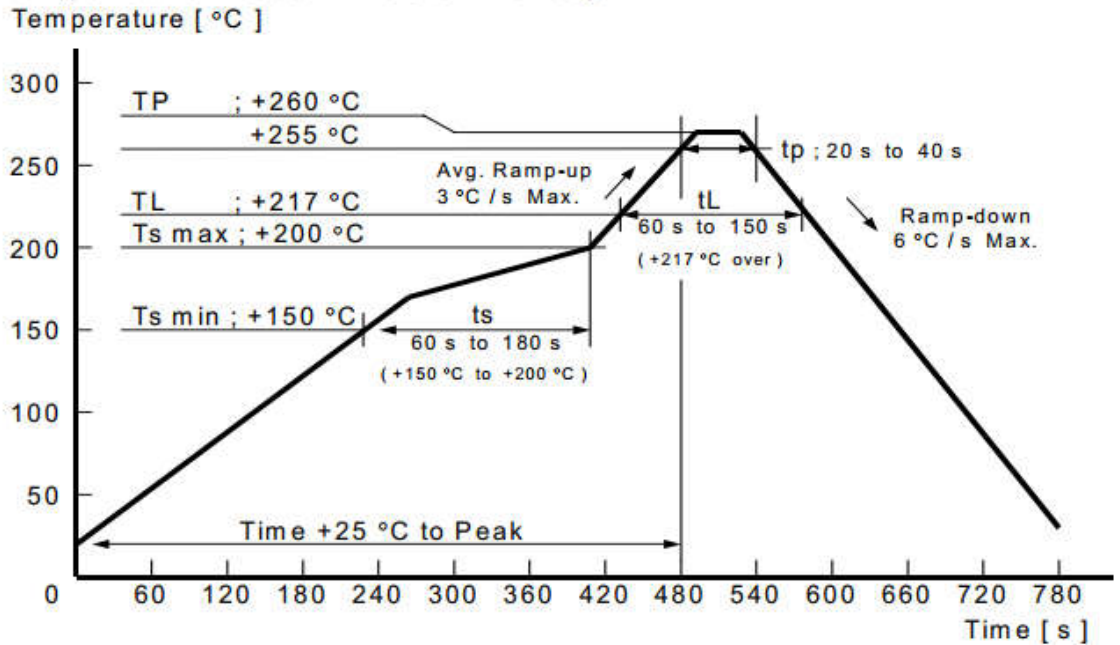
4. Startup behavior

4.1. WL_REG_ON & BT_RST_N

These pins are always an input pins, active low, with a PD during reset. This signal MUST be active during power supplies initialization and, when all power supplies are stable, it must remain active low for at least 2 cycles of the slow clock in order to insure good reset functionality.

When WL_REG_ON is low, the WIFI chip is power down.

When BT_RST_N is low, the WIFI chip is power down.

4.2. UART and SPI interface

UART_CTS is an input with PU, UART_RXD is an input with PU, UART_TXD toggles from input PU to output High and UART_RTS toggles from input PU to output Low 70ms after reset, enabling UART communication if needed.

5. RF Path Control

5.1. ART6212 Control

Version	Path
ART6212-T	WLAN 2.4GHz uses external ANT; BLE uses external

	ANT; WLAN 5GHz uses external antenna

6. Ordering Information

Part Name	Description
ART6212-T-CM	Combo WiFi and BLE. External ant for WLAN/BLE 2.4GHz
ART6212-T-WF	WiFi only External ant for WLAN
ART6212-T-BLE	BLE only External ant for BLE

7. Warning

Please note that 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.

This equipment complies with radio frequency exposure limits set forth by the FCC for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the device and the user or bystanders.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

The user (OEM) must follow the datasheet instruction and Hardware guide. It is better to use the datasheet part3 reference design.

The OEM integrator must make the label (containing FCC ID X3ZWFMOD1) can be seen by the operator.

Associated authorized antenna(s)

Authorized Antennas			
Model	Type	Connector	Antenna Gain
AT3216-B2R7HAA	Surface Mount	Solder	2.4GHz~2.483GHz:0.5dBi
AT3216-B5R5HAA	Surface Mount	Solder	4.9GHz ~ 5.85GHz: 2dBi
47950-1011	PCB trace	U.FL	2.4GHz~2.483GHz:3dBi

8. Revision History

Date	Revision	Description
24 May 2016	0.1	Preliminary draft
2 Aug, 2016	1.0	Added BLE and WiFi only options to part number
29 Dec 2016	1.1	Change the UART TXD\RXD definition
20 Jan 2017	1.2	Added recommended crystal and load capacitors