WB61 Datasheet

Amp'ed RF Technology, Inc.

WB61 Product Specification

26.9 mm x 15.2 mm x 2.8 mm

Description

Amp'ed RF Tech presents our WB61 Wi-Fi & Bluetooth combo module: 802.11abgn/Bluetooth v4.0. The WB61 is a small footprint low cost RF module intended to help customers shorten product development cycles and reduce cost. It is fully compatible with Linux & Android systems, or our own upper layer stack, Amp'ed UP, for a complete host & controller solution.

Features

WLAN

- 802.11a/b/g/n, 802.11d, 802.11r
- Output Power, +21.5dBm
- Interface, SDIO 2.0, SPI
- Wi-Fi Direct (concurrent)
- Wi-Fi Display
- Wi-Fi Protected Setup
- Soft Access Point
- Hotspot 2.0
- Security: WPAI/WPA2, AES, WEP

Bluetooth

- Bluetooth v4.0 + BLE
- Protocol Stack, up to HCI
- Output Power, +13dBm
- Interface, H4 (UART), PCM Audio
- Wi-Fi coexistence for BT Classic and BLE

Hardware

- Serial interfaces: UART, PCM, SDIO
- Deep sleep current, 20 μA
- 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
Signal Pin Voltage	-	1.8	-	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	-	+2.5	Volts
RF input power	-	-	-5	dBm

1.3. Current Consumption

Modes (WLAN Max Power Consumption) V_{BAT}=3.6v	Avg	Unit
Complete Power Down (PMUEN 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	6	µA
System deep sleep mode	30	µA
Page and inquiry scan (Page period=1.28s, Inquiry period=2.56S	574	µA
Sniff in Master mode (Master, Tsniff=1.28s, 4 attempts, 0 sniff timeout	129	µA
Sniff in Slave mode (Slave, Tsniff=1.28s, 4 attempts, 0 sniff timeout	155	µA
Sniff in Master mode (Master, Tsniff=500ms, 4 attempts, 0 sniff timeout	255	µA
Sniff in Slave mode (Slave, Tsniff=500ms, 4 attempts, 0 sniff timeout	437	µA
HVS+Sniff in Master mode (HVS, Sniff (Master, 500ms, 4 attempts, 0 sniff timeout), P=1.28s; I=2.56s	TBD	mA
HVS+Sniff in Slave mode (HV3, Sniff (Slave, 500ms, 4 attempts, 0 sniff timeout), P=1.28s; I=2.56s	15.236	mA
2-EV3+Sniff in Master mode (2-EV3, T_eSCO=12, W_eSCO=2; Sniff (Master, 500ms, 4 attempts, 0 sniff timeout), P=1.28S; I=2.56s	TBD	mA
2-EV3+Sniff in Slave mode (2-EV3, T_eSCO=12, W_eSCO=2; Sniff	9.728	mA

(Slave, 500ms, 4 attempts, 0 sniff timeout), P=1.28S; I=2.56s		
DH1 TX- DH5 RX in Master mode (@maximum throughput)	36.641	mA
DH1 TX- 3-DH5 RX in Master mode (@maximum throughput)	41.7	mA
DH5 TX- Null RX in Master mode (@maximum throughput)	TBD	mA
3-DH5 TX- Null RX in Master mode (@maximum throughput)	TBD	mA
A2DP from FM RX (TX 3-DH5- RX null, 400 kbps, A2DP SBC high quality joint stereo host off-load from FM RX48 kHz)	TBD	mA
A2DP from PCM/I2S1 and I2S2 (TX 3-DH5 - RX Null, 400 kbps,A2DP SBC high quality joint stereo host off-load from I2S 500 kHz burst mode)	TBD	mA
BLE: Advertising (nonconnectable) (Interval: 1.28s;Data:15; bytes 3 channels)	TBD	µA
BLE: Advertising (discoverable) (Interval: 1.28 s;Data: 15 bytes;3 channels)	TBD	µA
BLE: Scanning (Interval: 1.28 s;Window: 11.25 ms;Single frequency per window)	TBD	µA
Link layer connection (Master;Interval: 500 ms;Slave Latency: 0;Empty TX/RX packets)	TBD	µA
Link layer connection (Master;Interval: 1 s;Slave latency: 0;Empty TX packets;RX payload: 27 bytes)	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/g DSSS/CCK	21.25	dBm
Output Power	802.11b/g BPSK 1/2	21.25	dBm
Output Power	802.11b/g BPSK 3/4	21.25	dBm
Output Power	802.11b/g QPSK 1/2	21.25	dBm
Output Power	802.11b/g QPSK 3/4	21.25	dBm
Output Power	802.11b/g 16QAM 1/2	21.25	dBm
Output Power	802.11b/g 16QAM 3/4	20.25	dBm
Output Power	802.11b/g 64QAM 2/3	19.25	dBm
Output Power	802.11b/g 64QAM 3/4	18.25	dBm
Output Power	802.11n MCS-0	21.25	dBm
Output Power	802.11n MCS-1	21.25	dBm
Output Power	802.11n MCS-2	21.25	dBm
Output Power	802.11n MCS-3	21.25	dBm
Output Power	802.11n MCS-4	20.25	dBm
Output Power	802.11n MCS-5	19.25	dBm
Output Power	802.11n MCS-6	18.25	dBm
Output Power	802.11n MCS-7	17.00	dBm
Wi-Fi Transmitter 5GHz, 11n			
Output Power	802.11n MCS-0	19.5	dBm

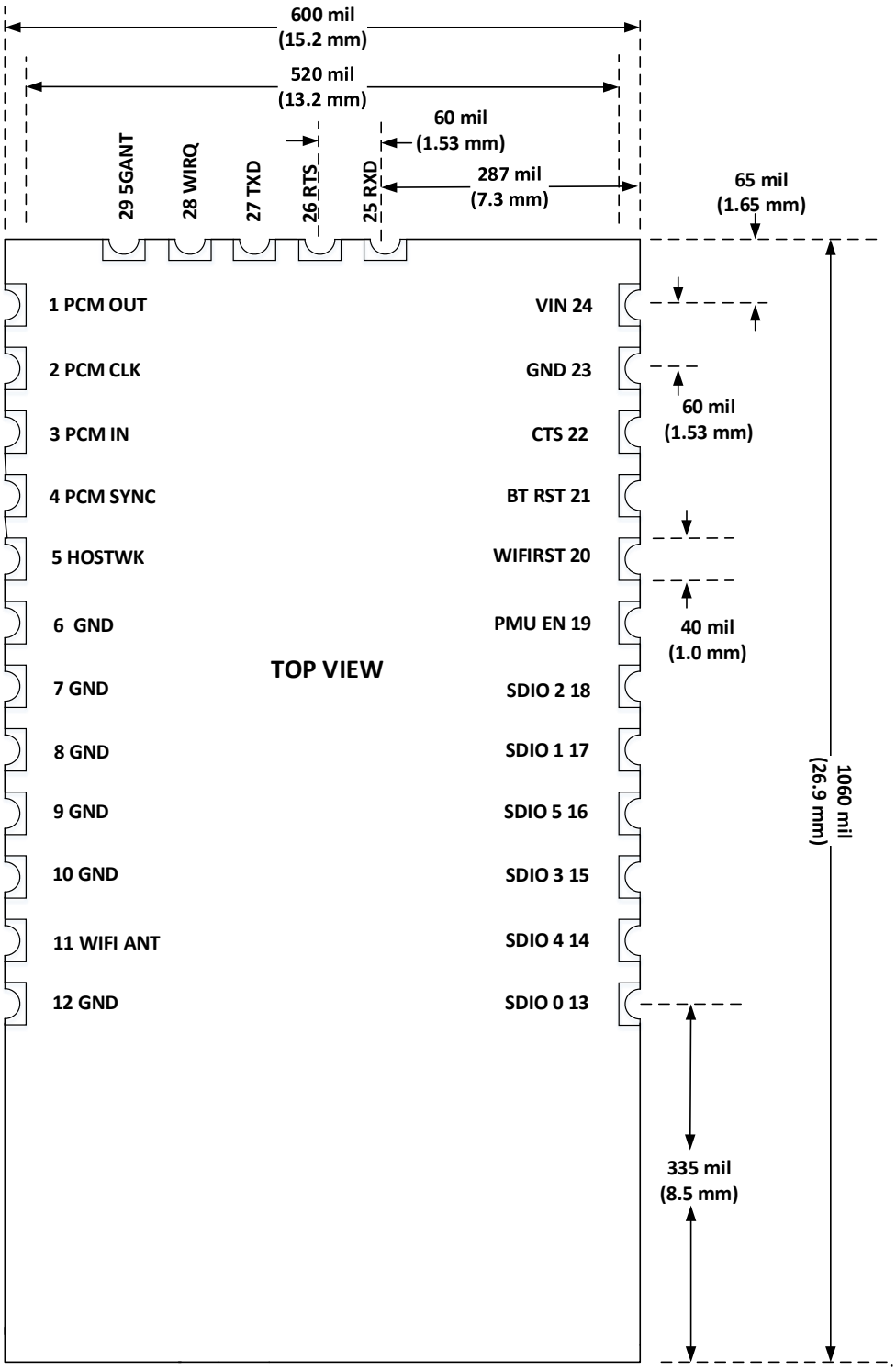
Output Power	802.11n MCS-7	14.5	dBm
Bluetooth Receiver			
Receiver sensitivity (clean transmitter)	FSK (1Mbps), BER≤0.1%	-92	dBm
Receiver sensitivity (dirty transmitter)	FSK (1Mbps), BER≤0.1%	-91	dBm
EDR sensitivity 2 Mbps (clean transmitter)	PSK(2Mbps and 3Mbps), BER≤0.01%	-92	dBm
EDR sensitivity 3 Mbps (clean transmitter)	PSK(2Mbps and 3Mbps), BER≤0.01%	-86	dBm
EDR sensitivity 2 Mbps (dirty transmitter)	PSK(2Mbps and 3Mbps), BER≤0.1%	-91	dBm
EDR sensitivity 3 Mbps (dirty transmitter)	PSK(2Mbps and 3Mbps), BER≤0.1%	-85	dBm
Bluetooth Transmitter			
Frequency range		2400~2483.5	MHz
Maximum output power	FSK(1Mbps)	13	dBm
Minimum output power	FSK(1Mbps)	-20	dBm
Minimum output power in inquiry mode	FSK(1Mbps)	-30	dBm
Output power accuracy	FSK(1Mbps)	±2	dB
Maximum output power	PSK(2 Mbps)	10	dBm
Maximum output power	PSK(3 Mbps)	10	dBm
EDR relative transmit power	PSK(2Mbps and 3Mbps)	0	dB
Minimum output power	PSK(2Mbps and 3Mbps)	-20	dBm
BLE Transmitter			
Maximum output power		13	dBm
Minimum output power		-20	dBm
Minimum output power in advertising mode		-30	dBm
Output power accuracy		±2	dB
BLE Receiver			
Receiver sensitivity (clean transmitter)	PER<30.8%	-93	dBm
Receiver sensitivity (dirty transmitter)	PER<30.8%	-92	dBm

1.5. Pin Assignment WB61S

Name	Type	Pin #	Description	ALT Function
Power and Ground				
VIN		24	VIN	
GND		23	GND	
Control				
BTRST	I	21	BT Reset input	
WIFIRST	I	20	WLAN Reset input	
PMUEN	O	19	External PMU enable	
HOSTWK	O	5	Host Wakeup output	
GND		6	GND	
UART				
RXD	I	25	Receive data	
TXD	O	27	Transmit data	
RTS	O	26	Request to send (active low)	
CTS	I	22	Clear to send (active low)	
SDIO				
SDIO [0]	I/O	13	SDIO CMD	SPI DI
SDIO [1]	I/O	17	SDIO DATA0	SPI DO
SDIO [2]	I/O	18	SDIO DATA1	SPI INT
SDIO [3]	I/O	15	SDIO DATA3	SPI CSN
SDIO [4]	I/O	14	SDIO CLK	SPI CLK
SDIO [5]	I/O	16	SDIO DATA2	
SDIO INT	I	28	SDIO external interrupt	
PCM				
PCM	I/O	4	PCM SYNC	
PCM	I/O	2	PCM CLK	
PCM	I	3	PCM IN	
PCM	O	1	PCM OUT	
External Antenna				
GND		7	GND	
GND		8	GND	
GND		9	GND	
GND		10	GND	
ANT	I/O	11	Antenna port for WLAN and BT 2.4GHz	
ANT	I/O	29	Antenna port for WLAN 5GHz	
GND		12	GND	

1.6. Layout Drawing WB61S

Size: 26.9 mm x 15.2 mm x 2.8 mm (height)



2. Hardware Design

- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- The area around the antenna should be free of any ground planes, power planes, trace routings, or metal for at least 6.5 mm in all directions.
- Traces should not be routed underneath the module.

2.1. Module Reflow Installation

The WB61 is a surface mount Bluetooth module supplied on a 29 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 WB61

The follow circuits are examples of typical Linux based platform connections to the WB61 module.

TBD

4. Startup behavior

3.1. RESET

This pin is always an input pin, 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.

3.2. 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. WB61S Control

Version	Path
WB61S	WLAN 2.4GHz uses internal ANT; BT uses internal ANT; WLAN 5GHz uses external antenna
WB61S-EXT	WLAN 2.4GHz uses external ANT; BT uses external ANT; WLAN 5GHz uses external antenna

6. Ordering Information

Part Name	Description
WB61S	Internal antenna for WLAN/BT 2.4GHz
WB61S-EXT	WB61 with external antennas only

7. Revision History

Date	Revision	Description
9 February 2016	1.0	First release