2.4 GHz Wi-Fi Module User Manual

Revision History

Revision	Date	Reason	Edited By
A	11-04-2015	Preliminary release	Seton Kasmir
B	01-28-2016	Content amendments	Edward Lin
C	01-29-2016	Test method and antenna selection were added or modified	Edward Lin
D	02-02-2016	Correction on the antenna used at the test lab and add host PCB 50 ohm validation	Edward Lin

General Description

The 2.4GHz WiFi module comes with USB2.0 interface and RF output, it supports IEEE 802.11b/g/n standards. This module operates in 2.4GHz ISM frequency band with low power consumption it applies a highly integrated MAC/BBP and RF single chip with up to 150Mbps data rate. The module is designed to be soldered to a PCB with three external interfaces, power, USB data and u.fl antenna. The module comes fully tested and calibrated at the factory.

Features

- 20MHz/40MHz bandwidth support. 1T1R mode
- 802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 24, 36, 48, 54Mbps
- 802.11n: Support PHY rate up to 150Mbps
- Security support for WEP 64/128, WPA,WPA2, TKIP,AES

Specifications

Electrical Data

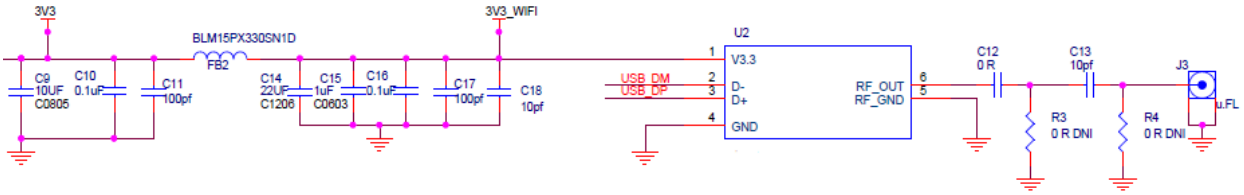
DC Characteristic (Typical)		
Operating Voltage	3.3VDC +/-5%	
Current consumption	Normal operation (Average)	<80mA
	Sleep mode	1.5 mA
	TX HT40,MCS7@16dBm	210 mA
	TX CCK	250 mA
	RX Listen	6 mA

RF Performance

RF Characteristics (Typical)	
Antenna	50 ohm external antenna via PCB soldering
Transmit Power	802.11b (CCK) 11Mbps: 18+/-1dBm
	802.11g (OFDM) 54Mbps: 16+/-1dBm
	802.11n (HT20@MCS7), 14+/-1dBm
	802.11n (HT40@MCS7),14+/-1dBm
Receive Sensitivity	802.11b: -88+/-1dBm;802.11g: -72+/-1dBm
	802.11n (HT20), -70+/-1dBm; 802.11n (HT40), -68+/-1dBm

Module Schematic Symbol

Reference Use Schematic

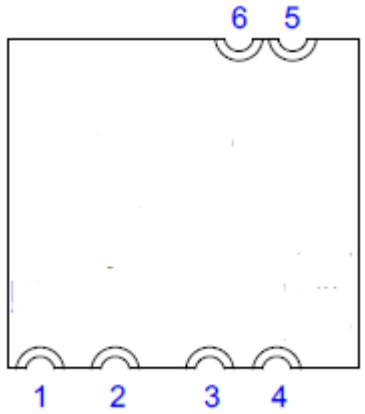


Pin Description

Pin	Name	Description
1	V3.3	+3.3 VDC
2	USB_DP	USB data-
3	USB_DM	USB data+
4	GND	Ground
5	RF GND	RF Ground
6	RF OUT	To antenna

Footprint

Bottom View



Antenna Installation

The module shall be mounted on a host PCB. A 50 ohm trace shall interface between pin 6 of the module and the antenna. In order to optimize the RF performance, a matching network may be needed along the 50 ohm trace. It is highly recommended that the distance between the RF port, pin 6 of the module, and the antenna port is less than 30mm to minimize the signal loss. The module can be interfaced with various types of single-ended antennas operating in 2.4GHz ISM band.

The following antenna is recommended for operating with this module.

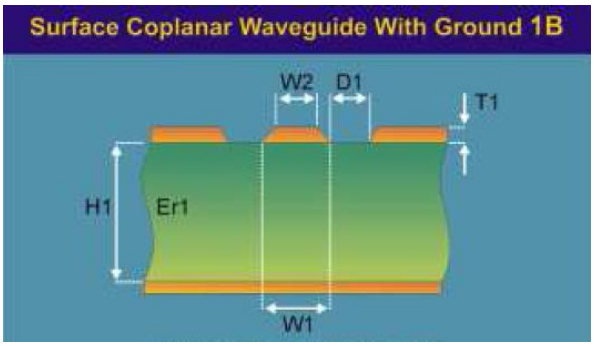
Antenna Manufactuer: AIR802
Model Number: ANRD245X02-RPSMA
Electrical Specifications

- Frequency 2400 - 2485 MHz
- Gain 2 dBi at 2.4 GHz
- VSWR < 1.5 at 2.4 GHz
- Polarization Vertical
- Vertical Beam Width 47°
- Horizontal Beam Width 360°
- Impedance 50Ω
- Max. Input Power 5 watts
- Weight 0.022 lbs (10 grams)
- Length 4.27 inches (108.5 mm)
- Connector Reverse Polarity SMA (RP-SMA) Plug (Male)
- Finish Matte Black

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

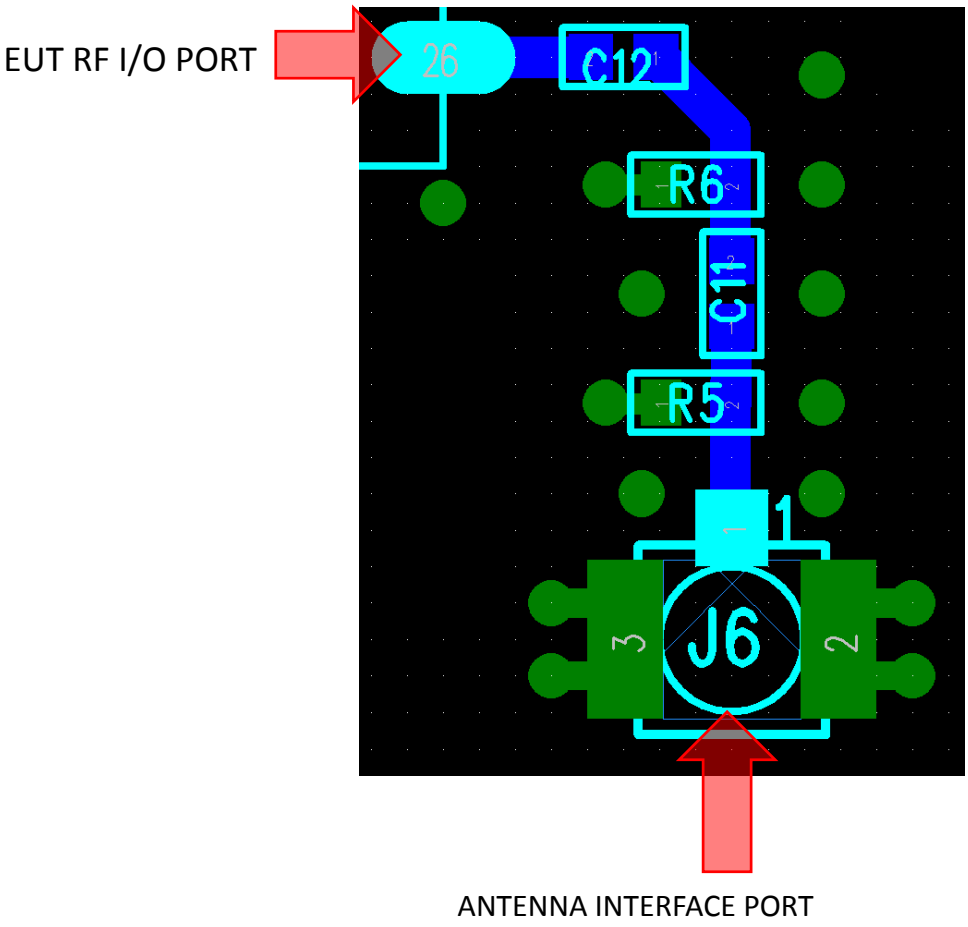
50 ohm Trace & PCB Layout Example

The following diagram shows the recommended PCB stack up configuration for the RF signal trace to have 50 ohms characteristic impedance. A microstrip structure is highly recommended on the host PCB to maintain RF signal integrity.



Dielectric thickness, H1 = 12 mils
Relative dielectric constant, Er1 = 4.2
Trace width, W1/2 = 22 mils
Ground strip separation, D1 >22mils
Copper thickness, T1 = 2.1 mils

In additional to the RF trace impedance on the PCB, matching network may be needed to properly interface with the antenna. The following diagram shows the matching network placement in one particular application.

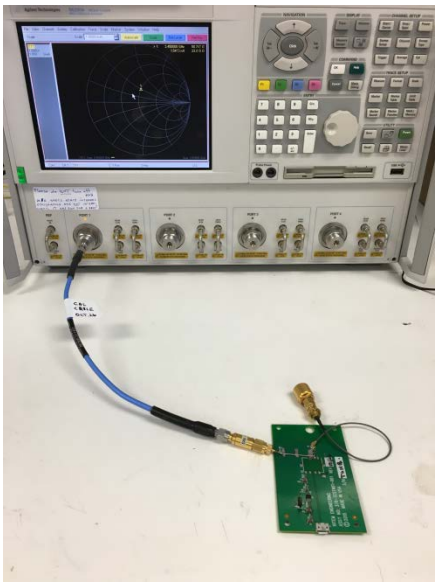


C12 = 0 Ω
R6 = 0 Ω
C11 = 10 pF
R5 = 0 Ω

Host PCB 50 ohm Impedance Validation

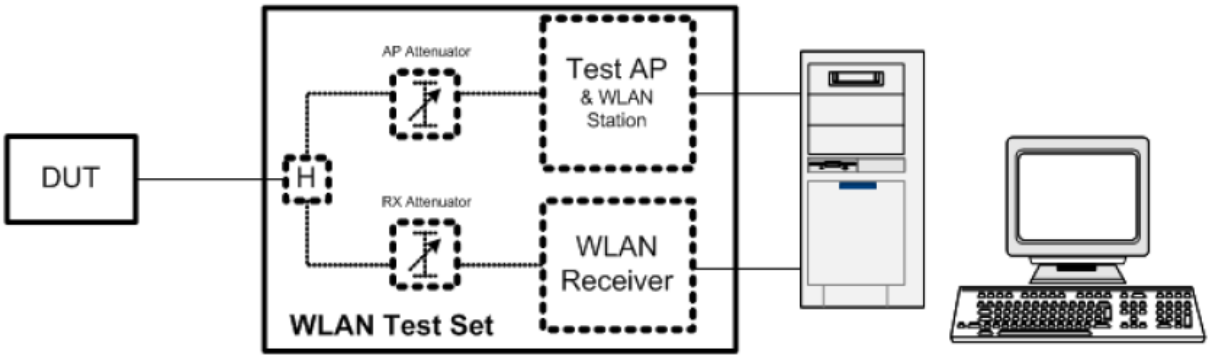
The impedance of the microstrip RF trace must be measured on the host PCB between pad 26 of the Wi-Fi module and the center mounting oad of the u.FL connector (pad 1 of J6) shown in the previous diagram with the RF coupling capacitor, C11, installed. A vector network analyzer (Agilent N5230A) or a Polar Impedance Control Test System or equivalent test equipment shall be used to conduct this test. The impedance measured must be within +/- 10% of 50 ohm in order for the PCB to be acceptable for usage.

The following picture is an example of the 50 ohm impedance test setup.



Module Test Method

The purpose of the test is to ensure the operation of the module once it has been installed on a host PCB. The following diagram shows the test setup. The WLAN test set is a LitePoint WLAN test set or equivalent equipment. Since the module has been installed on the host PCB, the connection between the test set and the module will be the antenna port on the host PCB. Using the test software the WLAN test set will conduct various tests to ensure the RF signal quality in both transmit and receive modes. This will also ensure the compliance of the FCC regulations.



FCC Certification

This device 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.

Labeling Instruction

If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, 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 Transmitter Module FCC ID: 2ADXI-SBHD10" or "Contains FCC ID: 2ADXI-SBHD10" Any similar wording that expresses the same meaning may be used.