SparkLAN WPEB-265AXI WiFi PCIe Industrial WiFi Module User Manual

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WiFi Module User Manual

SparkLAN

WPEB-265AXI(BT) [B33] & AP12275_PB33
WPEB-265AXI(BT) [B18] & AP12275_PB18
WPEB-265AXI(BT) [R33] & AP12275_PR33
WPEB-265AXI(BT) [R18] & AP12275_PR18

HW User manual

Version 0.0

Revision History

Date	Revision Content	Revised By	Version
2020/12/30	Initial released	Wayne	0.0

Contents

WPEB-265AXI(BT) [XXX] Series Hardware User Manual Introduction

This document provides customers with considerations for the hardware design of WPEB-265AXI(BT) [XXX] series. It includes hardware block diagram, reference design, PCB layout, and PCB stack up, which will be explained in detail below.

1.1. Module Block Diagram

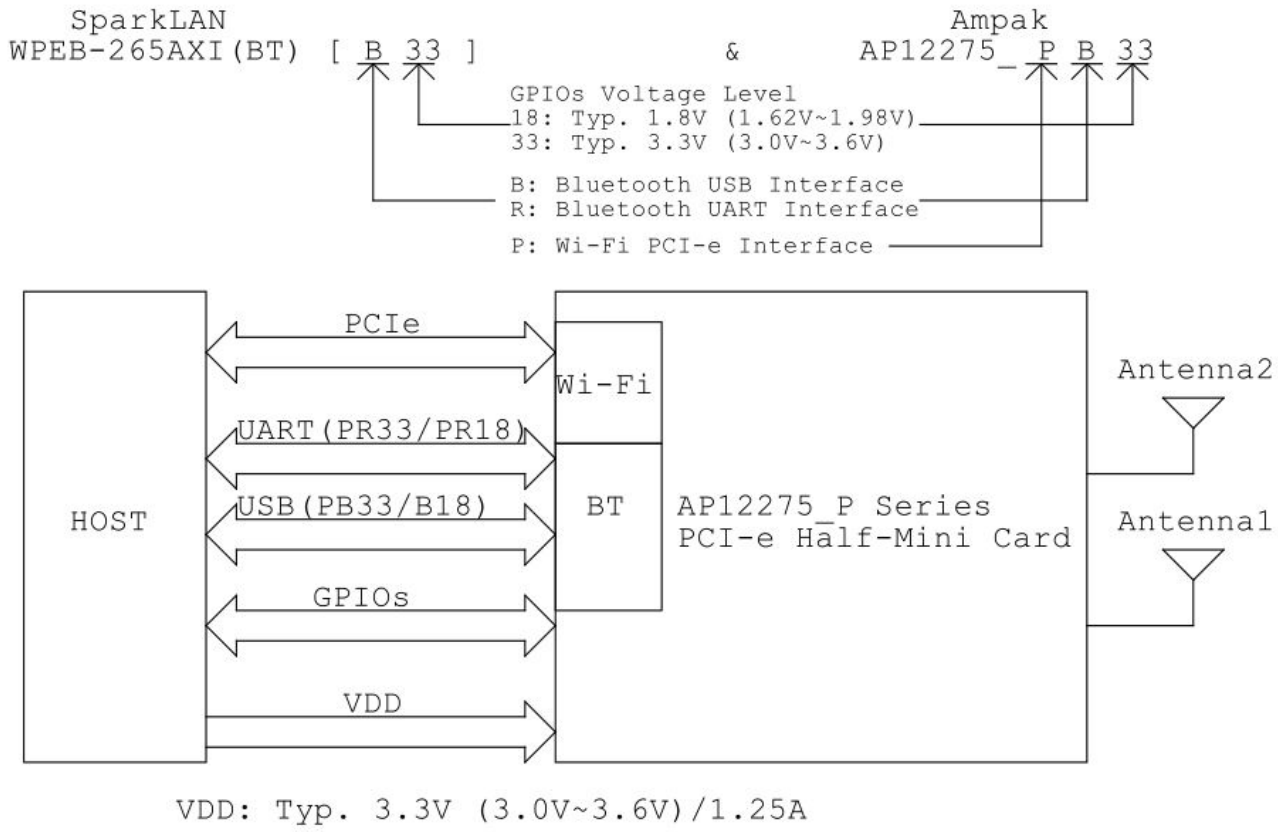

Figure 1. WPEB-265AXI(BT) [XXX] Series PCI-e Half-Mini Card Block Diagram

In Figure 1, The WPEB-265AXI(BT) [XXX] series PCI-e Half-Mini Card is a dual-band Wi-Fi 2×2 IEEE 802.11ax module with integrated Bluetooth 5.0. The WLAN host interface is PCI-e v3.0 compliant and runs at Gen2 speeds. The Bluetooth host interface is
a USB interface and it also supports UART interface. The WPEB-265AXI(BT) [XXX] is powered by the VDD (3.0V to 3.6V) supplies. All other voltages are provided by internal regulators.

1.2. External Reference Circuit

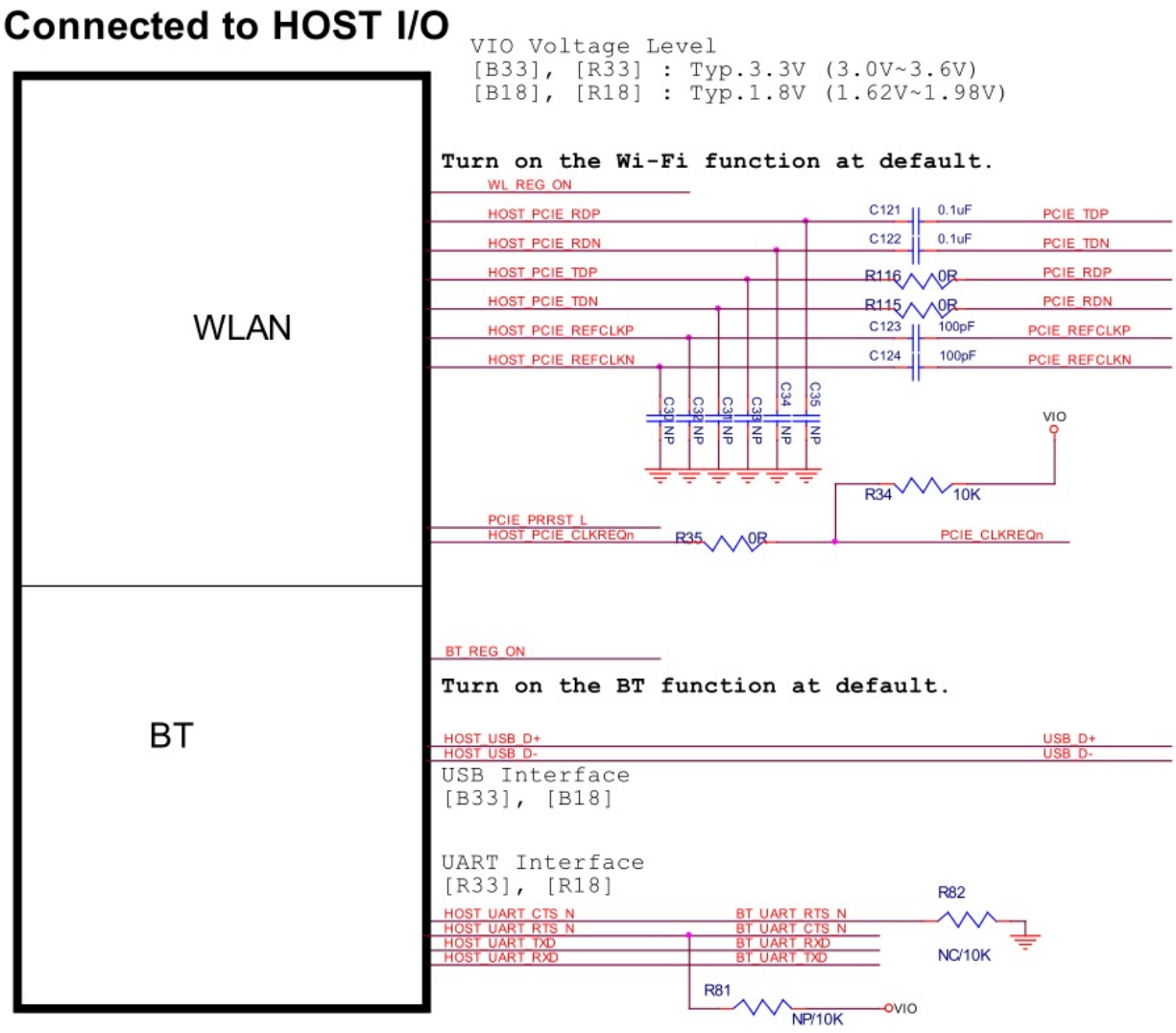

Figure 2. External Reference Circuit

The recommended schematic configuration for all of the interfaces and GPIOs are shown as figure 2. The connection block diagram of the PCI-e interface is shown in figure 3. However, the connection block diagram of UART and USB interfaces is shown in figure 4.

***Note:** The Bluetooth host interface only supports one of UART or USB for each kind of product.

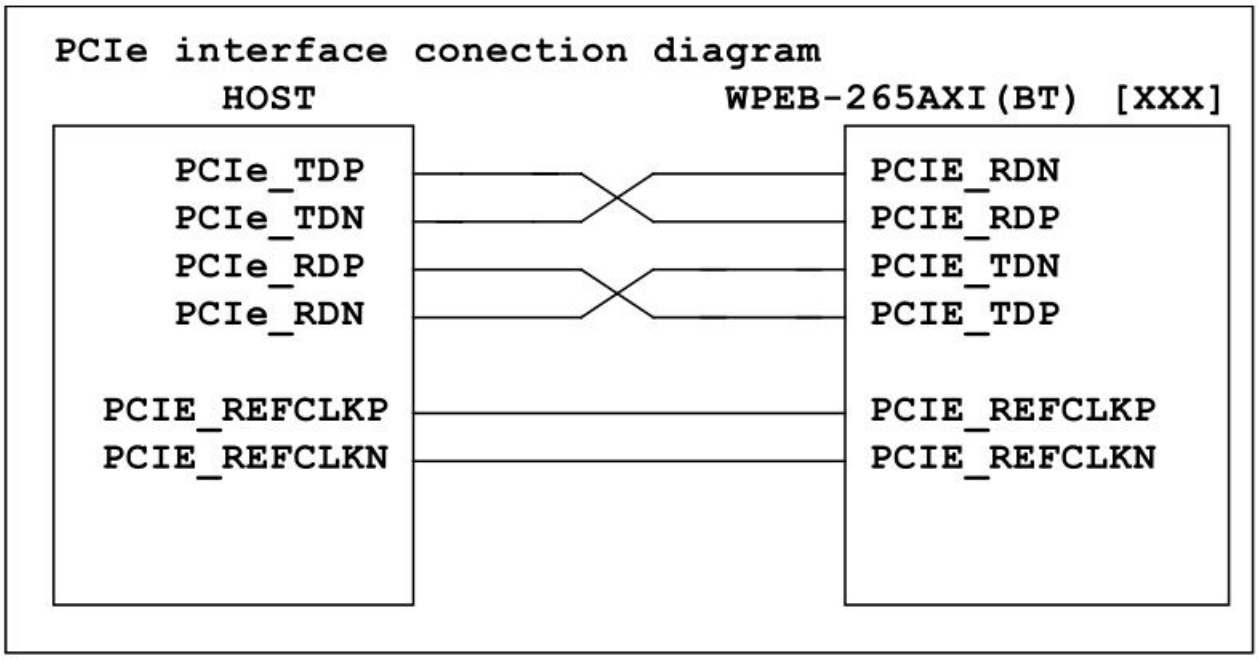

Figure 3. PCI-e Interface Connection Diagram

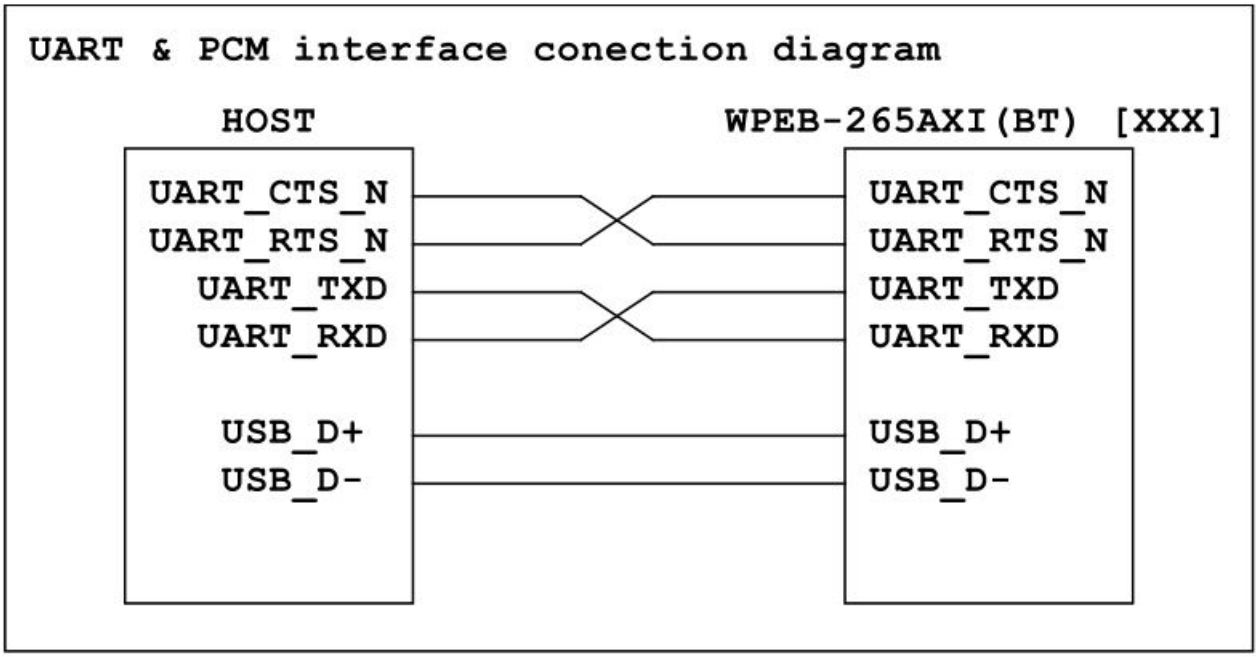

Figure 4. UART and USB Interface Connection Diagram

PCB Layout Guide

2.1. PCI-e Layout Guide

1. The PCI-e differential pair signals impedance target is 100±20% ohms impedance.
2. Do not place probe or test points on any high-speed differential signal.
3. Do not route high-speed traces under or near crystals, oscillators, clock signal generators, switching power regulators, mounting holes, magnetic devices, or ICs that use or duplicate clock signals.
4. The traces routing don’t be 90° angle.
5. For PCI-e add-in card, any layer under edge finger area should be removed. Including ground and power

layers.

6. Ensure that high-speed differential signals are routed at least 1.5 W (calculated trace-width × 1.5) away from voids in the reference plane. This rule does not apply where SMD pads on high-speed differential signals are voided.
7. Maximize differential pair-to-pair spacing when possible.

2.2 USB Layout Guide

1. DP/DM traces should always be matched lengths and must be no more than 4 inches in length; otherwise, the eye opening may be degraded.
2. Route DP/DM traces close together for noise rejection on differential signals, parallel to each other and within two mils in length of each other (start the measurement at the chip package boundary, not to the balls or pins).
3. A high-speed USB connection is made through a shielded, twisted pair cable with a differential characteristic impedance of 90 Ω ±15%. In layout, the impedance of DP and DM should each be 45 Ω ± 10%.
4. DP/DM traces should not have any extra components to maintain signal integrity. For example, traces cannot be routed to two USB connectors.
5. When a via must be used, increase the clearance size around it to minimize its capacitance. Each via introduces discontinuities in the signal's transmission line and increases the chance of picking up interference from the other layers of the board. Be careful when designing test points on twisted pair lines; through-hole pins are not recommended.

Federal Communication Commission Interference Statement:

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

RF exposure statements

This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body or nearby persons.

CFR 47 FCC PART 15 SUBPART C (15.247) and SUBPART E (15.407) has been investigated. It is applicable to the modular transmitter.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

This radio transmitter RYK-WPEB265AXIBT has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Unique antenna connector (RP-SMA) must be used on the Part 15 authorized transmitters used in the host product.

Antenna Type	Antenna Model	Maximum Gain (dBi)		Remark
		2.4 GHz	5GHz	
Dipole	AD-103AG	2.02 dBi	2.03 dBi	
Dipole	AD-302N	3.14 dBi	2.73 dBi	
Dipole	AD-303N	3.14 dBi	3.24 dBi	

Length of Antenna cable:150mm
Connector type of Antenna cable: I-PEX/MHF1 to RP-SMA(F)
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: RYKWPEB265AXIBT" Or "Contains FCC ID: RYK-WPEB265AXIBT"

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Industry Canada statement:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Caution:

1. The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
2. For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
3. For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate; and

Radiation Exposure Statement:
This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body

This radio transmitter (IC: 6158A-PEB265AXIBT has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

If the ISED certification 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 IC: 6158A-PEB265AXIBT”.

Manual Information To the End User:
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Must use the device only in host devices that meet the FCC/ISED RF exposure category of mobile, which means the device is installed and used at distances of at least 20cm from persons.
The end user manual shall include FCC Part 15 /ISED RSS GEN compliance statements related to the transmitter as show in this manual.
Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B, ICES 003.

Host manufacturer is strongly recommended to confirm compliance with FCC/ISED requirements for the transmitter when the module is installed in the host. Must have on the host device a label showing Contains FCC ID: 6158A-PEB265AXIBT, Contains IC: 6158A-PEB265AXIBT

The use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer’s instruction manual.

If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

Documents / Resources

	SparkLAN WPEB-265AXI WiFi PCIe Industrial WiFi Module [pdf] User Manual WPEB265AXIBT, RYK-WPEB265AXIBT, RYKWPEB265AXIBT, WPEB-265AXI, WPEB-265AXI, WPEB-265AXI, WPEB-265AXI WiFi PCIe Industrial WiFi Module, WiFi PCIe Industrial WiFi Module