

OWLAN211b i/x™

cB-0904

Electrical & Mechanical Datasheet

connectBlue

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cB-0904

Electrical & Mechanical Datasheet

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1 General Information

1.1 Overview

The Wireless LAN OWLAN211b module from connectBlue has been developed for integration in industrial devices providing state of the art low power features. The module minimizes the work needed to implement WLAN (802.11b) in a device as it provides all hardware, type approval, EMC certification etc. It is developed for reliable, high demanding industrial devices/applications.

The WLAN module together with the driver software package makes a complete WLAN implementation. The driver is available for Linux and Windows CE and may be adapted for any little endian micro controller. The software driver works as the interface between the TCP/IP stack in the device and the module.

The WLAN module has the same form factor and interface layout as the Bluetooth modules from connectBlue, which enables customers to prepare their device for both Bluetooth and/or WLAN.

- Supports 802.11b
- Software driver available or adaptable for any device
- Bluetooth co-location with PTA (Packet Traffic Arbitration) support
- Radio type approved for Europe
- Radio type approved for US and Canada
- Compliant with EMC standards
- Industrial temperature range -30 to +85 C
- No host processor load
- Low power requirements
- Compatible with connectBlue Bluetooth modules
- Supports security features WEP64, WEP128, WPA, WPA2 (TKIP/PSK)
- Quality of Service: 802.11e and WMM
- Ad-hoc and infrastructure mode
- Internal or dual external antennas

1.2 Related Documents

There are some documents related to the OWLAN211b i/x module (see Figure 1):

- The **OWLAN211b Host Driver Documentation** contains description of the Host driver and it's requirements.
- The **OWLAN211b Electrical & Mechanical Datasheet** (this document) contains important information about the OWLAN211b module. Read this document if you plan to mount the OWLAN211b module on your design.

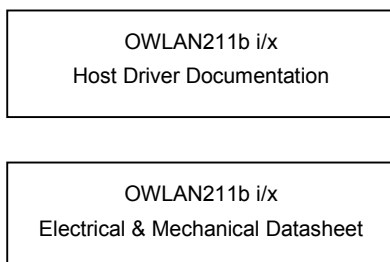


Figure 1: CB-OWLAN211b documents

1.3 Product Variants

This Electrical and Mechanical datasheet contains information about the variants of OWLAN211b modules based on the PCB cB-0904 (see Table 1).

Table 1: Product variants

	Product Name	Module ID / FCC ID	Description
Internal antenna	CB-OWLAN211bi-02	cB-0095-01 / PVH090402	OWLAN211b with internal antenna, 2 x 10 pin header
	CB-OWLAN211bi-04	cB-0096-01 / PVH090402	OWLAN211b with internal antenna, no 2 x 10 pin header Note: Available upon request.
External antenna	CB-OWLAN211bx-02	cB-0097-01 / PVH090402	OWLAN211b with external antenna, 2 mm pin connector. Receive diversity supported.
	CB-OWLAN211bx-04	cB-0098-01 / PVH090402	OWLAN211b with external antenna, no pin connector. Receive diversity supported. Note: Available upon request.

1.4 OWLAN211b

OWLAN211b is a small size WLAN module based on the Phillips BGW200 system in package (SiP) chip-set. The modules are available in many different antenna and connector combinations. See Figure 2 and 3 for some of the available models. All models are described in Table 1.

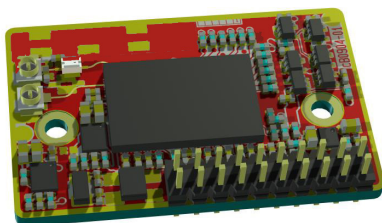


Figure 2: OWLAN211bx-02 module with 2 external antennas and pin header

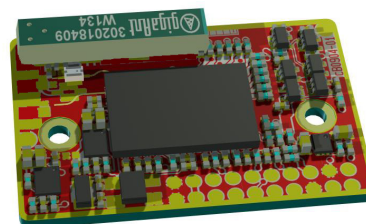


Figure 3: OWLAN211bi-04 module with internal antenna

1.5 Block Diagram OWLAN211b

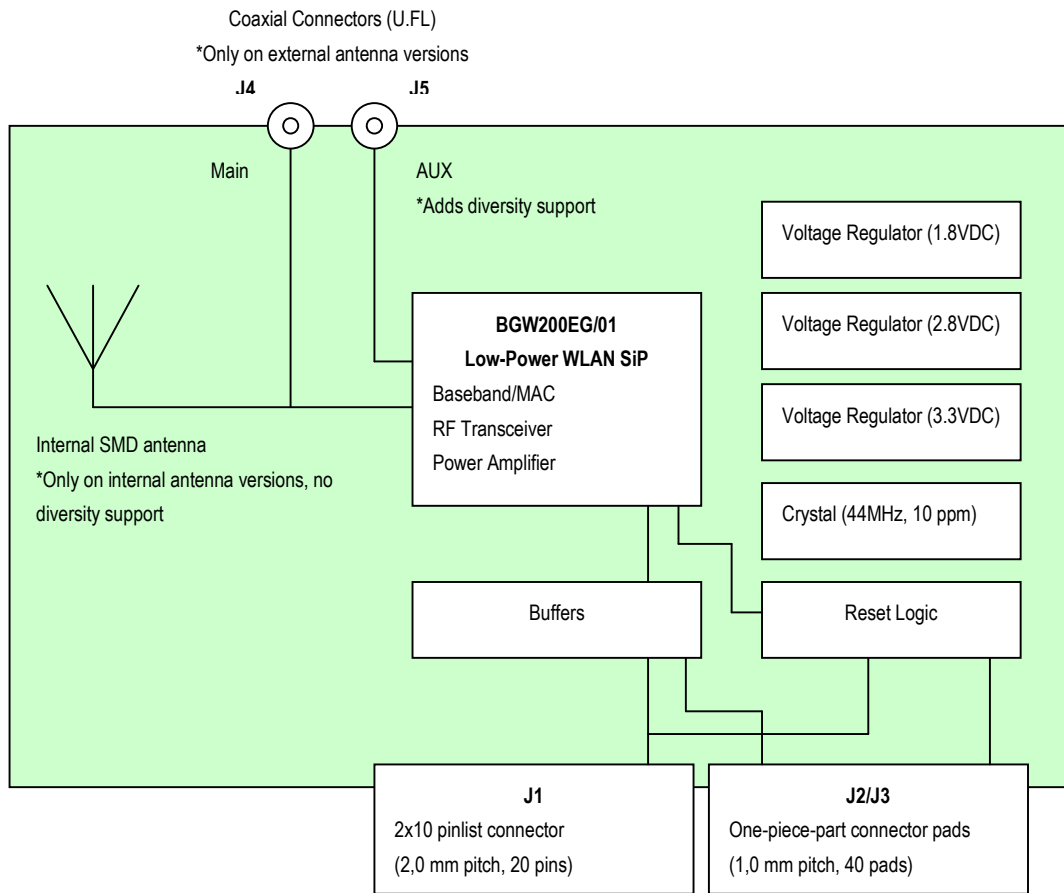


Figure 4: Block diagram of OWLAN211b

2 Electrical Interface and Connectors

This section describes the signals available on the module interface connectors. There are two ways to connect to the OWLAN211b module:

- Connector J1 a 2 mm pitch 2x10-pin header (see Figure 5).
- Connectors J2 and J3 a 2x20-pin 1 mm pitch board-to-board (one piece part). The J2 and J3 connectors exist on the OWLAN211b module only as compression pads (see Figure 6).

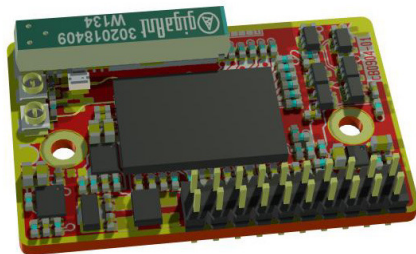


Figure 5 Primary side of OWLAN211b

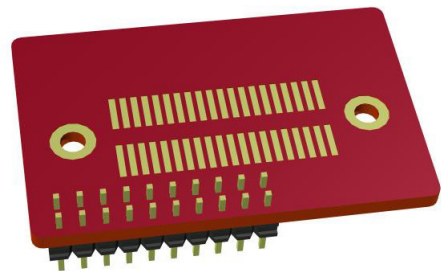


Figure 6 Secondary side of OWLAN211b

2.1 Pin Numbering

2.1.1 Primary side connectors

J1 is the 2 x 10 pin header, 2 mm pitch located on the primary side of the module.

A1 is the internal antenna.

J4 and J5 are U.FL connectors for external antennas. J4 is the primary antenna connector and J5 the auxiliary antenna connector.

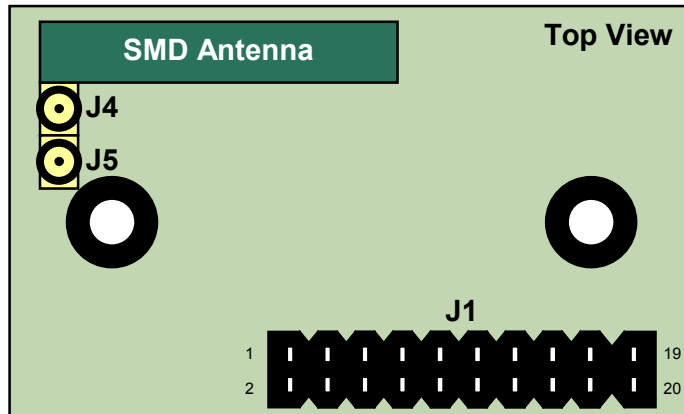


Figure 7: Primary side connectors

2.1.2 Secondary side connectors

J2 and J3 is the connectBlue board-to-board connector.

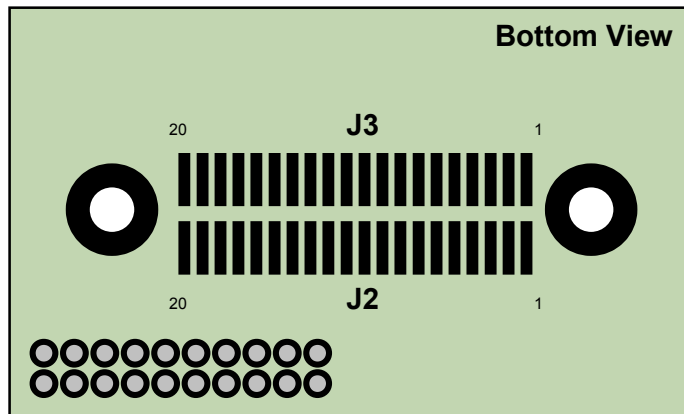


Figure 8: Secondary side connectors

2.1.3 J1 Connector Description

Table 2: Signals on connector J1

Pin Nr	Pin Name	Signal Level	Type	Description
1, 2	VSS	Ground	Power	Ground (0 V)
3, 4	VDD	3.3 V	Power	Supply voltage (3.3 – 5.5 VDC)
5 – 9	-	-	-	Reserved, do not connect**
10	RESET-n	CMOS	In	Active low. Must be driven by open drain collector Internal pull-up 56 kΩ.
11 – 12	-	-	-	Reserved, do not connect**
13	SPI-MOSI*	CMOS	In	SPI Slave Input.
14	SPI-CS-n*	CMOS	In	SPI Chip Select. Internal pull-up 56 kΩ.
15	VDD	3.3 V	Power	Supply voltage (3.3 – 5.5 VDC)**
16	VSS	Ground	Power	Ground (0 V)**
17	VSS	Ground	Power	Ground (0 V)**
18	SPI-CLK*	CMOS	In	SPI Clock input, Max clock frequency 48 MHz
19	SPI-ExInt*	CMOS	Out	SPI Interrupt signal
20	SPI-MISO*	CMOS	Out	SPI Slave Output, 3-state output buffer active when: SPI-CS-n = low Internal pull-up 56 kΩ.

* Signals are CMOS logic level. ($-0.3\text{ V} < V_{\text{IL}} < 0.8\text{ V}$, $2 < V_{\text{IH}} < 3.3\text{ V}$)

** To remain compatible, please check the datasheet for other connectBlue products using this pin.

2.1.4 J2 Connector Description

Table 3: Signals on connector J2

Pin Nr	Pin Name	Signal Level	Type	Description
1, 2	VSS	Ground	Power	Ground (0 V)
3, 4	VDD	3.3 V	Power	Supply voltage (3.3 – 5.5 VDC)
5 – 15	-	-	-	Reserved, do not connect**
16	UART-TxD*	CMOS	Out	Transmit Data, debug UART
17	-	-	-	Reserved, do not connect**
18	UART-RxD*	CMOS	In	Receive Data, debug UART
19-20	-	-	-	Reserved, do not connect**

* Signals are CMOS logic level. ($-0.3\text{ V} < V_{\text{IL}} < 0.8\text{ V}$, $2 < V_{\text{IH}} < 3.3\text{ V}$)

** To remain compatible, please check the datasheet for other connectBlue products using this pin.

2.1.5 J3 Connector Description

Table 4: Signals on connector J3

Pin Nr	Pin Name	Signal Level	Type	Description
1 – 5	-	-	-	Reserved, do not connect**
6	SPI-CS-n*	CMOS	In	SPI Chip Select. Internal pull-up 56 kΩ.
7	SPI-MOSI*	CMOS	In	SPI Slave Input.
8	VSS	Ground	Power	Ground (0 V)**
9 – 10	-	-	-	Reserved, do not connect**
11	SPI-CLK*	CMOS	In	SPI Clock input, Max clock frequency 48 MHz
12	VSS	Ground	Power	Ground (0 V)**
13	SPI-MISO*	CMOS	Out	SPI Slave Output, 3-state output buffer active when: SPI-CS0-n = low OR SPI-CS1-n = low Internal pull-up 56 kΩ.
14	SPI-ExInt*	CMOS	Out	SPI Interrupt signal (BGW211)
15	PRI*	CMOS	In	Bluetooth co-existence interface: Bluetooth high priority traffic indicator.
16	BT*	CMOS	In	Bluetooth co-existence interface: Bluetooth arbitration signal.
17	WL*	CMOS	Out	Bluetooth co-existence interface: WLAN arbitration signal.
18	RX-IND*	CMOS	Out	Bluetooth co-existence interface: WLAN receive indicator.
19	RESETn*	CMOS	In	Active low. Must be driven by open drain collector. Internal pull-up 56 kΩ.
20	-	-	-	Reserved, do not connect**

* Signals are CMOS logic level. ($-0.3\text{ V} < V_{\text{IL}} < 0.8\text{ V}$, $2 < V_{\text{IH}} < 3.3\text{ V}$)

** To remain compatible, please check the datasheet for other connectBlue products using this pin.

2.1.6 J4 External Main Antenna Connector

J4 is the main antenna connector. It is used for both transmit and receive. The port impedance to match is 50 Ω .

Table 5: Signals on J4

Pin Nr	Pin Name	Signal Level	Type	Description
1	AntMain	RF	I/O	Primary external antenna port (50 Ω)

Note: this connector is only available on the CB-OWLAN211bx-02/04

2.1.7 J5 External Auxiliary Antenna Connector

J5 is the auxiliary external antenna connector. It is used only for receiving and if the unit is configured for diversity mode. The unit never transmits RF through this antenna connector. The port impedance to match is 50 Ω .

Table 6: Signals on J5

Pin Nr	Pin Name	Signal Level	Type	Description
1	AntAux	RF	I	Auxiliary antenna port (50 Ω)

Note: this connector is only available on the CB-OWLAN211bx-02/04

2.2 Characteristics

2.2.1 Power Supply

Table 7: Power supply

Symbol	Parameter		Value	Unit
VDD	Power supply	Min	3.3	V
		Max	5.5	V

Table 8: Current consumption

Symbol	Mode		Value	Unit
ICC @ VDD 4.0 V	Reset	Average	20	μA
	Idle, firmware not loaded	Average	24	mA
	Idle, active mode	Average	157	mA
	Connected, active mode	Average	160	mA
	Connected, sleep mode	Average	3	mA
	Connected, active mode, data transfer	Max	350	mA
	Connected, sleep mode, data transfer	Max	350	mA

2.2.2 Input/Output Signals

Table 9: Input/output signals

Symbol	Parameter	Value	Unit
V_{IN} Low	Logic LOW level input voltage on all logic	Min	-0.3 V
		Max	0.85 V
V_{IN} High	Logic HIGH level input voltage	Min	2.1 V
		Max	3.3 V
V_{OUT} Low	Logic LOW level output voltage	Max	0.4 V
V_{OUT} High	Logic HIGH level output voltage	Min	2.5 V
I_{GPIO}	Sink and source current	Max	4 mA
C_{GPIO}	Input capacitance	Typ	8 pF
$V_{th(POR)}$	Lower Power-on reset threshold voltage	Typ	0.4 V
$V_{th(POR)}$	Upper Power-on reset threshold voltage	Typ	2 V

Note: SPI-MOSI, SPI-CLK and SPI-CS-n are 5 V tolerant

2.2.3 Environmental

Table 10: Temperatures characteristics

Parameter		Product Variant	Value	Unit
Storage temperature	Min	CB-OWLAN211bi/x-02	-40	°C
		CB-OWLAN211bi/x-04		
	Max	CB-OWLAN211bi/x-02	+125	°C
		CB-OWLAN211bi/x-04		
Operating temperature	Min	CB-OWLAN211bi/x-02	-30	°C
		CB-OWLAN211bi/x-04		
	Max	CB-OWLAN211bi/x-02	+85	°C
		CB-OWLAN211bi/x-04		

2.3 Hardware Reset

A hardware reset input is available on the J1 and J3 connectors (see section 2.1). An external reset source must be open drain or collector. The RESETn pin is pulled-up internally with 56 k Ω .

See example in A.2.2

2.4 Power Control

The OWLAN211b module can be put in one of four power modes.

- Active mode – No power saving is done.
- Sleep mode – Power saving. The module is held in low power mode and only listens and responds to beacons.
- Powersave mode – Maximum power save. The device is incapable of transmitting or receiving data.
- Reset mode – The RESETn pin is held low.

3 Antennas

There are 2 different antenna options available:

- An internal surface mounted (SMD) antenna.
- Two U.FL connectors for external antenna.
Different types of external antennas are available.

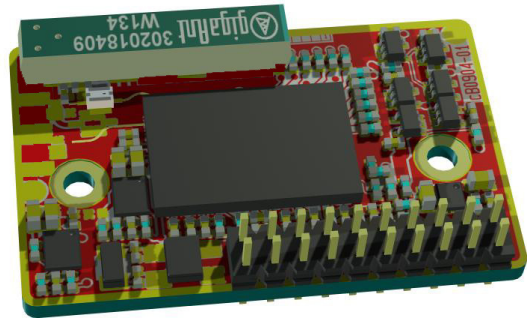
See section 4.1 for more information on antenna placement.

This chapter gives a quality overview of the different antenna options.

3.1 Surface Mounted Antenna (internal)

The unit cannot be mounted in a metal-shielded enclosure with this antenna.

Part Number	OWLAN211i
Antenna name	Mica 2.4 GHz
Manufacture	gigaAnt
Polarization	Linear
Gain (Typ)	2.5 dBi
Antenna Size (LxWxH)	20.5 x 3.6 x 3.3 mm
Comment	The antenna gain is dependent of the mounting of the module. See section 4.4 for mounting the module considering the antenna.



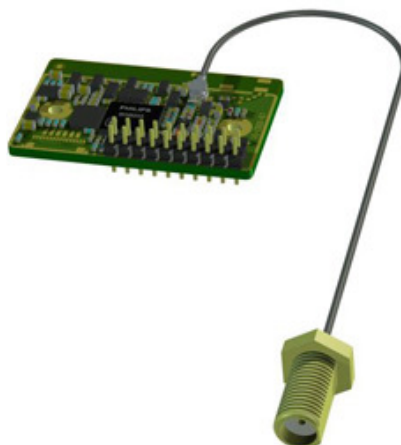
3.2 External Antennas

The external antennas are connected to the board through an U.FL connector. Some of the antennas are connected directly to the U.FL connector of the board and some are connected using a SMA connected through a short U.FL to SMA adapter cable.

Note: Antennas with SMA connectors are not approved for use in USA or Canada due to FCC regulations.

3.2.1 Antenna Accessories

Part Number	cB-ACC-18
Name	U.FL to SMA adapter cable
Connector	U.FL and SMA female
Cable length	120 mm
Cable loss	Less than 0.5 dBm



Comment The SMA connector may be mounted in a panel.

Approval Not approved for use in the US and Canada.

3.2.2 Antennas

Part Number	cB-ACC-16
Name	WCR-2400-SMA
Manufacture	Centurion
Type	½ wave dipole
Polarization	Vertical
Gain	+2 dBi
Size	100 mm
Connector	SMA male



Comment To be mounted on the U.FL to SMA adapter cable.

Approval Not approved for use in the US and Canada.

Part Number	cB-ACC-27
Name	WCR-2400-IP04
Manufacture	Centurion
Type	½ wave dipole
Polarization	Vertical
Gain	+2.0 dBi
Size	108 mm (Straight)
Connector	U.FL connector
Comment	To be mounted on the U.FL connector on the PCB.
Approval	Approved for use in the US and Canada



Part Number	cB-ACC-17
Name	Reel planTec Blue-tooth m70
Manufacture	Reel
Size (ØxH)	75x20 mm
Gain	+1 dBi
Mounting	M16 x 13.6 mm
Cable length	3 m
Connector	SMA male
Other info	Waterproof (IP67)
Comment	To be mounted on the U.FL to SMA adapter cable.
Approval	Not approved for use in the US and Canada



Part Number	cB-ACC-23
Name	Mobile Mark Stub
Manufacture	Mobile Mark Communications Antennas
Type	¼ wave dipole
Polarization	Vertical
Gain	0 dBi
Connector	SMA male
Comment	To be mounted on the U.FL to SMA adapter cable
Approval	Not approved for use in the US and Canada



Part Number	cB-ACC-21
Name	Rugged SMA
Manufacture	Radiall/Larsen
Type	½ wave dipole
Polarization	Vertical
Gain	2 dBi
Connector	SMA male
Comment	To be mounted on the U.FL to SMA adapter cable
Approval	Not approved for use in the US and Canada



4 Mounting Information

4.1 Module Dimensions

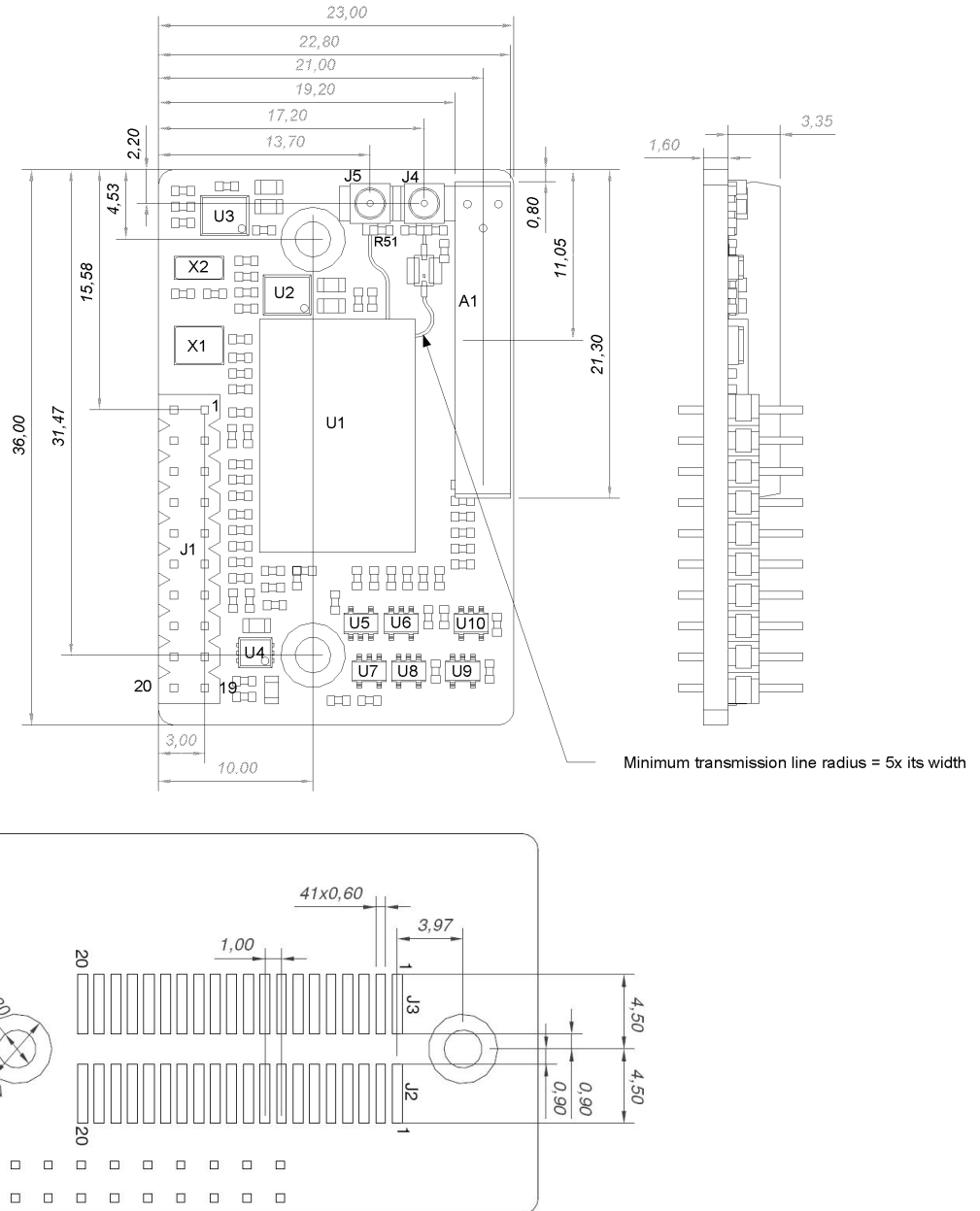


Figure 9: OWLAN211b dimensions [mm].

4.2 Using the J2/J3 Board-to-Board Connectors

The board-to-board connector should be a 1 mm pitch one-piece part connector. The recommended manufacture is Samtec with many connector options available; see section 4.2.1.1. Chapter 2 contains more information about the connector and the electrical interface.

4.2.1 Suitable One-Piece Part Connectors

4.2.1.1 Double row ASP-118580-01 / ASP-118581-01 Connectors

This connector is a double row connector and connects both J2 and J3.

This connector has a height of 3.0 mm and this has to be considered if components are to be mounted on the motherboard under the OWLAN211b board. The connector is also available with a height of 6.0 mm and 10.0 mm (The FSI-120 series from Samtec).

There are alignment pins on the bottom side of the connector.

The connector is available with M2 threaded inserts (ASP-118580-01) that fit the mounting holes on the board. You may screw the OWLAN211b board directly into these inserts. If you want to have a tighter and more secure mounting you may use longer screws and secure it using a nut on the backside of the motherboard.

Another way to mount the module is to use press-fit nuts on the motherboard and skip the M2 threads on the connector (ASP-118581-01), see section 4.3 for more information about press-fit nuts.

Table 11: Double row connectors from Samtec.

Samtec order number	Quote number	Equivalent part	Package	Remark
REF-120021-01	55392	FSI-120-03-G-D-AB	Tube	Align pin on bottom side only
REF-120021-02	55392	FSI-120-03-G-D-AB-K-TR	Tape-n-Reel	Align pin on bottom side only
REF-120018-01	55392	FSI-120-03-G-D-M-AB	Tube	With M2 threaded inserts and align pin on bottom side only
REF-120018-02	55392	FSI-120-03-G-D-M-AB-K-TR	Tape-n-Reel	With M2 threaded inserts and align pin on bottom side only

NOTE:

When ordering connectors from Samtec or an official Samtec distributor, please use the REF order number and refer to the connectBlue global quote number for best price. For technical questions regarding the Samtec connectors please contact connectBlue or Samtec at (Scandinavia@samtec.com).

See Figure 10 for more information about the connector and necessary measurements on the motherboard. The large mounting holes on the motherboard are designed for press-fit nuts and could be smaller if press-fit nuts are not used.

4.3 Using Press-Fit Nuts for Mounting the Module

A press-fit nut is pressed into the PCB from the bottom side with a special press tool. M2 sized press-fit nuts are suitable for the modules (see Figure 10) and are manufactured by PEM Fastening Systems (www.pemnet.com), part no KFS2-M2 (see Figure 11). Be careful with the distance between the nuts regarding alignment.

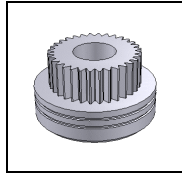


Figure 11: KFS2-M2 press-fit nut.

Spacer-pipes are recommended to use between the PCBs when press-fit nuts are used.

4.4 Antenna Issues

The unit cannot be mounted arbitrary, because of the radio communication. The unit with an internal surface mounted antenna (OWLAN211bi) cannot be mounted in a metal enclosure.

No metal casing or plastics using metal flakes should be used, avoid also metallic based paint or lacquer. Keep a minimum clearance of 10 mm between the antenna and the casing. Keep 10 mm free space from metal around the antenna.

If a metal enclosure is required, one of the external antenna options has to be used. See section 3.2 for more information on the antenna options available.

5 WLAN Information

In the tables below you can find information about WLAN properties.

Table 12: WLAN information CB-OWLAN211b

Parameter	Data
Radio	Phillips BGW200 (16 dBm)
RF output power	max 16 dBm
Receive sensitive level	-85 dBm
Receive input level (max)	-20 dBm
Output frequency	2.402 –2.480 GHz, ISM band.
WiFi Certified	
Bluetooth coexistence	

6 Regulatory Information

6.1 Declaration of Conformity TBD



We, **connectBlue AB**, of
Norra Vallgatan 64 3V
SE-211 22 Malmö, Sweden

declare under our sole responsibility that our products:

cB-OWLAN211bi (cB-0095, cB-0096),
cB-OWLAN211bx (cB-0097, cB-0098)

to which this declaration relates, conforms to the following product specifications:

R&TTE Directive 1999/5/EC

EN 300 328 V1.6.1 (2004-11)

EMC Directive: 89/336/EEC

EN 301 489-1 V1.4.1 (2002-08)

EN 301 489-17 V1.2.1 (2002-08)

EN 61000-6-2 (2001)

Safety Compliance

EN 60950-1:2001 and/or IEC 60950-1:2001 (1st Edition)

EN 60950-1/A11:2004 + Corrigendum:2004

24/09/2005 Malmö, Sweden

Mats Andersson

CTO of connectBlue AB

If a cB-OWLAN211b i/x is used within EU a notification may be necessary to be made to each of the **national authorities responsible for radio spectrum management of the intention to place radio equipment that uses frequency bands whose use is not harmonized throughout the EU, on its national market.**

More information at: <http://europa.eu.int/comm/enterprise/rtte/gener.htm>

6.2 FCC and IC Compliance

See Table 1 for information about the different product variants.

6.2.1 Compliance for OWLAN211b

6.2.1.1 FCC Statement for OWLAN211b

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.

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

6.2.1.1.1 Antenna

Our module type OWLAN211b is for OEM integrations only. The end-user product will be professionally installed in such a manner that only the authorized antennas are used.

6.2.1.1.2 Caution

Any changes or modifications NOT explicitly APPROVED by connectBlue AB could cause the module to cease to comply with FCC rules part 15, and thus void the user's authority to operate the equipment.

6.2.1.2 IC Compliance

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.

This device has been designed to operate with an antenna having a maximum gain of 9 dBi.

Having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropic radiated power (EIRP) is not more than that required for successful communication.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

6.2.1.3 Labeling Requirements for End Product

For an end product using the product OWLAN211b there MUST be a label containing, at least, the following information:

This device contains
FCC ID: PVH090402
IC: 5325A-090402

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

In accordance with 47 CFR § 15.19 the end product shall bear the following statement in a conspicuous location on the device:

"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."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC ID label must be displayed on the device.

In case, where the final product will be installed in locations where the end-consumer is not able to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end-product manual.

6.2.1.4 RF-exposure Statement for OWLAN211b

This modular transmitter MUST have a separation distance of at least 20 cm between the antenna and the body of the user or nearby persons.

If the radio module is installed in a laptop display, transmission MUST be prevented if the lid is closed to ensure that the minimum distance of 20 cm between the user and the transmitting antenna is maintained.

Any notification to the end user of installation or removal instructions about the integrated radio module is NOT allowed.

6.3 UL Listing Information

If a customer intends to UL list a product including the OWLAN211b based on the PCB cB-0904-02 this information is useful:

The printed circuit board if produced according to the following specification:

- UL recognized ZPMV2 min. 130 °C flame class V-0 or better.

6.4 Compliance with RoHS directive



The OWLAN211b are produced according to the RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) directive and complies with the directive.

7 Guidelines for Efficient and Safe Use

7.1 General

Read this information before using your OWLAN211b module.

For any exceptions, due to national requirements or limitations, when using your OWLAN211b module, please contact connectBlue AB.

Note: Changes or modifications to the product not expressly approved by connectBlue AB will void the user's authority to operate the equipment.

7.2 Product Care

- Do not expose your product to liquid or moisture.
- Do not expose you product to extreme hot or cold temperature (see Section 2.2.3 for further information)
- Do not expose your product to lit candles, cigarettes, cigars, open flames, etc.
- Do not drop, throw or try to bend your product since rough treatment could damage your product.
- Do not attempt to disassemble your product. Doing so will void warranty. The product does not contain consumer serviceable or replaceable components. Service should only be performed by connectBlue AB.
- Do not paint your product as the paint could prevent normal use.
- If you will not be using your product for a while, store it in a place that is dry, free from damp, dust and extreme heat and cold.
- The clearance and creepage distances required by the end product must be withheld when the module is installed.
- The cooling of the end product shall not negatively be influenced by the installation of the module when the module is installed.

7.3 Radio Frequency Exposure

The OWLAN211b module contains a small radio transmitter and receiver. During communication with other WLAN products the OWLAN211b module receives and transmits radio frequency (RF) electromagnetic fields (microwaves) in the frequency range 2400 to 2500 MHz. The output power of the radio transmitter is very low.

When using the OWLAN211b module, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations.

7.4 Electronic Equipment

Most modern electronic equipment, for example, in hospitals and cars, is shielded from RF energy. However, certain electronic equipment is not. Therefore:

Note: This equipment emits RF energy in the ISM (Industrial, Scientific, Medical) band. Please insure that all medical devices used in proximity to this device meet appropriate susceptibility specifications for this type of RF energy.

7.5 Potentially Explosive Atmospheres

Turn off your electronic device before entering an area with potentially explosive atmosphere. It is rare, but your electronic device could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas, such as petrol station, below deck on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

7.6 Safety Compliance

In order to fulfill the safety standard EN 60950-1:2001 the OWLAN211g must be supplied by a Class-2 Limited Power Source.

7.6.1 Power Supply

- Connect your power supply only to designated power-sources as marked on the product.
- Make sure all cords and cable are positioned so that they will not be stepped on, tripped over or otherwise subject to damage or stress.
- To reduce risk of electric shock, unplug the unit from any power source before attempting to clean it.

Appendix A - Application Notes

Usually only a subset of the available functionality is of interest to the designer. In addition, depending on the host system, the electrical interface can be designed in many ways. The designer can use the step-by-step guide in this chapter as an aid in the design process.

A.1 Step-by-Step Guide

Table 13: Step-by-step guide with Yes and No answers.

Question	Yes	No
Are you going to integrate the OWLAN211b module in a metal enclosure?	The internal antenna models cannot be used. Use the OWLAN 211bx.	You are free to choose between the products. The internal antenna models are lower cost and are easier to design-in. However, an external antenna could give better range.
Do you wish to use SPI when communicating with the OWLAN211b module?	TBD	TBD
	TBD	TBD
Are you using a 5 V host system?	The SPI interface is 5 V tolerant	TBD
Is low power consumption important?	The CB-OWLAN211b module can be held in RESET mode to enable maximum power saving.	
Do you want to manually reset the module?		

A.2 Design Examples

A.2.1 Basic Design

Basic desing example showing how to connect an OWLAN211 bi/x (SPI bus) to a microcontroller.

Note: The 22 uF decoupling capacitor must be positioned close to the module power supply pins. This to compensate for the current peaks during power up and reset release.

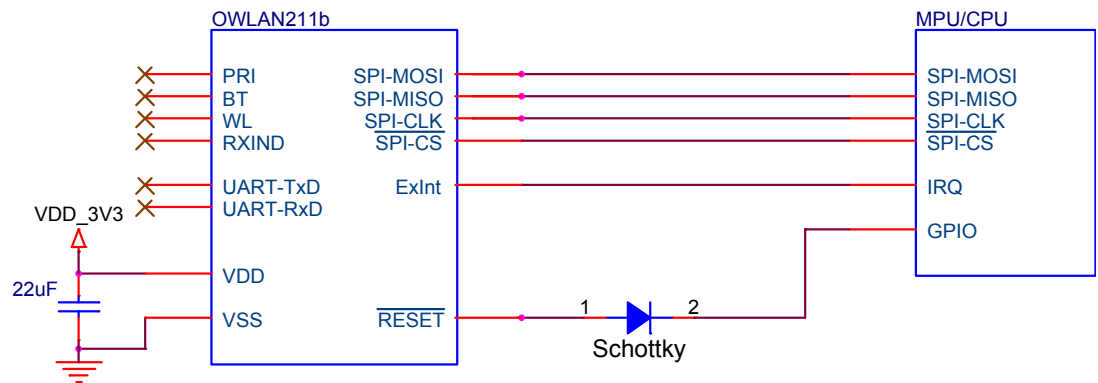


Figure 12: Basic design example.

A.2.2 Reset

The RESETn pin can be connected to an external reset source, see Figure 13 for a switch example.

If the reset signal is connected to an output signal it must be an open drain or collector, see Figure 14 and Figure 15.

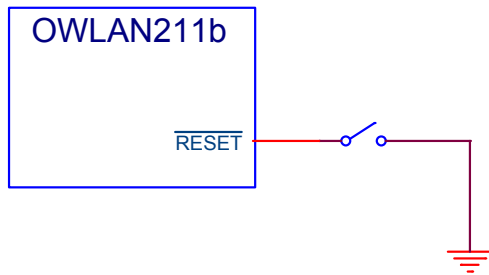


Figure 13: A reset switch.

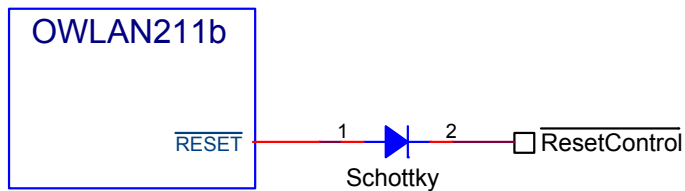


Figure 14: 3.3 V design of an open drain reset from an active high output.

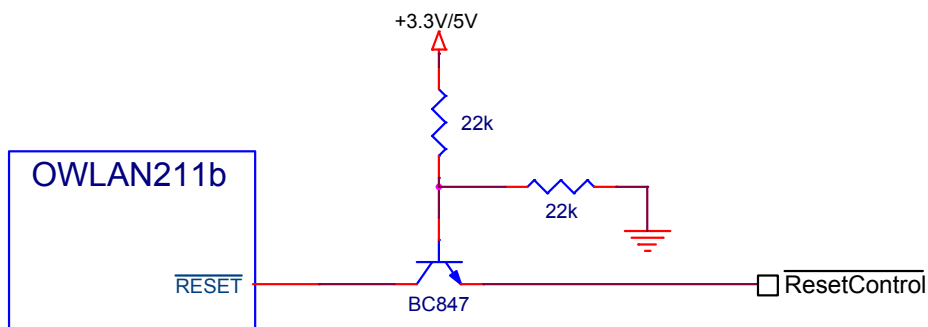


Figure 15: 3.3/5 V design of an open collector reset from an active high output.

The RESETn pin can be left unconnected if not used.

A.3 Test Points

The firmware outputs diagnostic messages during runtime to aid driver development and for easier troubleshooting. The messages are output as serial data, TTL-level, at test point 4. See Figure 16 for localization of test points.

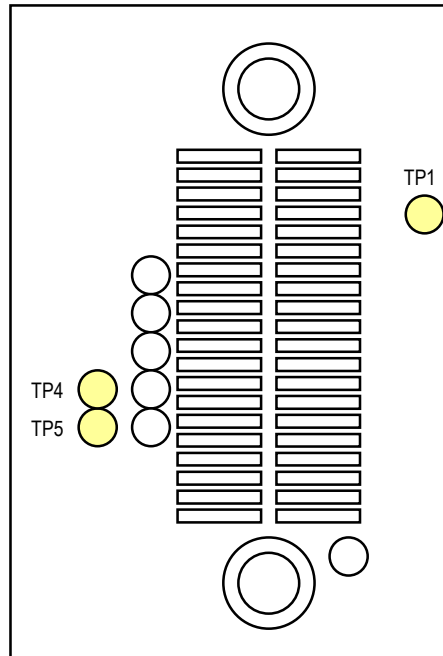


Figure 16: Bottom View showing the location of test points.

A RS232 level shifter needs to be used if the diagnostic messages shall be logged using a PC.

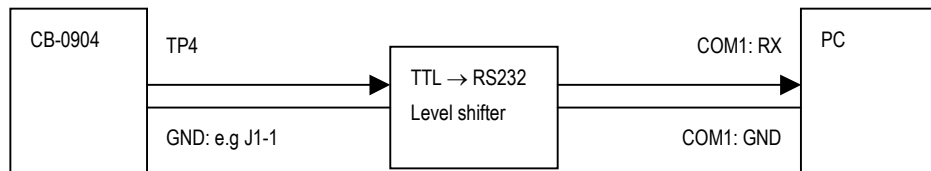


Table 14: Test Points

Symbol	Parameter	Signal Level	Type	Description
TP1	REFCLK_OUT	CMOS	O	Clock reference output. Basic variance: 44.000000 MHz ± 10 ppm
TP4	TX	CMOS	O	Diagnostic Messages @ 38400 baud, 8-data bits, even parity, 1 stop-bit
TP5	RX	CMOS	I	Do not connect.

A.3.1 Examples

The following are examples of diagnostic output from the device.

NOTE: The output format is not fixed and can therefore change without notice between different versions of the firmware. The examples listed below are shown for an education purpose only.

A.3.1.1 After Firmware Download

After firmware download is completed the following output is given:

```
Copyright 2005 Philips Semiconductors Inc.  
WLAN SOFTWARE BUILD VERSION 6.35.11.17.05  
Nov 17 2005, 13:07:39  
BUILD FOR RELEASE, 0th time run...  
Me B1  
0:12:F3:FF:FF:FD  
LA 1
```

The most important information, besides the fact that the firmware is actually loaded and running, are the version number and the MAC address. The example above lists firmware version 6.35 and a MAC address of 00:12:F3:FF:FF:FD

A.3.1.2 Scan

```
>Sc  
<sc
```

Scan commands are, similar to other commands, prefixed with a '>' to indicate start of command, and a '<' to indicate end of command.

A.3.1.3 WEP Keys

```
Pairwise WEP key installed
```

The message above shows a successful installation of a WEP key.

A.3.1.4 Association

```
Me B1
***cb-test3
>MESC
>Sc
<sc
<MeSc
J-Cfm
As-Req
As-Res
CW value15
TXOP: 0
CW value15
TXOP: 0
CW value7
TXOP: 94
CW value3
TXOP: 47
A
```

The example above shows a successful association with an access point named "cb-test3". The following sequence can be read:

1. A scan is issued to find the access point. (Sc)
2. A join confirm is received. (J-Cfm)
3. An association request is made. (As-Req)
4. An association response is received. (As-Res)
5. Association complete and successful. (A)