

7. Power Consumption

7.1 Description of Device States

The ATWINC15x0-MR210xB has several device states:

- ON_Transmit – Device is actively transmitting an 802.11 signal. This is the highest output power and nominal current consumption.
- ON_Receive – Device is actively receiving an 802.11 signal. This is the lowest sensitivity and nominal current consumption.
- ON_Doze – Device is ON but is neither transmitting nor receiving.
- Power_Down – Device core supply off (Leakage).
- IDLE connect – Device is connected with 1 DTIM beacon interval.

The following pins are used to switch between the ON and Power_Down states:

- CHIP_EN – Device pin (pin #22) used to enable DC/DC Converter
- VDDIO – I/O supply voltage from external supply
In the ON states, VDDIO is on and CHIP_EN is high (at VDDIO voltage level). To switch between the ON states and the Power_Down state, CHIP_EN has to change between high and low (GND) voltage. When VDDIO is off and CHIP_EN is low, the chip is powered off with no leakage (refer to [Restrictions for Power States](#)).

7.2 Current Consumption in Various Device States

Table 7-1. Current Consumption

Device State	Code Rate	Output power, dBm (1, 2)	Current Consumption ⁽¹⁾	
			IVBATT	IVDDIO
ON_Transmit	802.11b 1 Mbps	17.5	268 mA	22 mA
	802.11b 11 Mbps	18.5	264 mA	22 mA
	802.11g 6 Mbps	17.5	269 mA	22 mA
	802.11g 54 Mbps	16.0	266 mA	22 mA
	802.11n MCS 0	17.0	268 mA	22 mA
	802.11n MCS 7	14.5	265 mA	22 mA
ON_Receive	802.11b 1 Mbps	N/A	61 mA	22 mA
	802.11b 11 Mbps	N/A	61 mA	22 mA
	802.11g 6 Mbps	N/A	61 mA	22 mA
	802.11g 54 Mbps	N/A	61 mA	22 mA
	802.11n MCS 0	N/A	61 mA	22 mA
	802.11n MCS 7	N/A	61 mA	22 mA
ON_Doze	N/A	N/A	380 µA	<10 µA
Power_Down	N/A	N/A	<0.5 µA	<3.5 µA

Notes:

1. Measured conditions (Channel 6): VBATT @ 3.3V, VDDIO@ 3.3V, temp. 25°C
2. RF output power is approximately 1 dB lower for the ATWINC15x0 UB module.

7.3 Restrictions for Power States

When no power is supplied to the device, for example, the DC/DC Converter output and VDDIO are both off (at ground potential), a voltage cannot be applied to the device pins because each pin

contains an ESD diode from the pin to supply. This diode will turn on when a voltage higher than one diode drop is supplied to the pin.

If a voltage must be applied to the signal pads while the chip is in a low-power state, the VDDIO supply must be on, so the SLEEP or Power_Down state can be used.

Similarly, to prevent the pin-to-ground diode from turning on, do not apply a voltage that is more than one diode drop below the ground to any pin.

7.4 Power-up/down Sequence

The power-up/down sequence for ATWINC15x0-MR210xB is shown in the following figure. The timing parameters are shown in the following table.

Figure 7-1. Power Up/Down Sequence

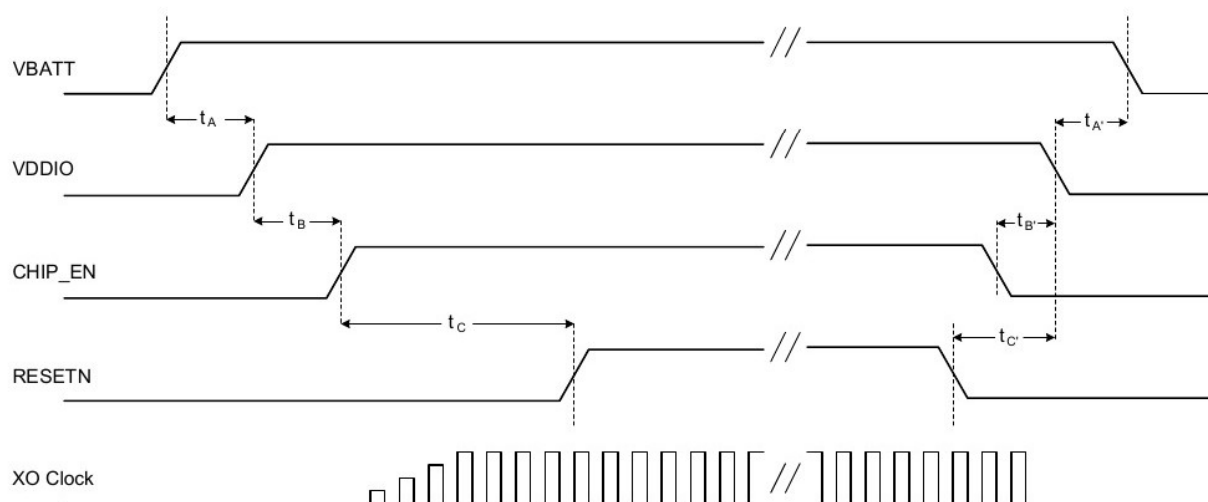


Table 7-2. Power-up/down Sequence Timing

Parameter	Min.	Max.	Units	Description	Notes
t_A	0	—	ms	VBATT rise to VDDIO rise	VBATT and VDDIO can rise simultaneously or can be tied together. VDDIO must not rise before VBATT.
t_B	0	—	ms	VDDIO rise to CHIP_EN rise	CHIP_EN must not rise before VDDIO. CHIP_EN must be driven high or low, not left floating.
t_C	5	—	ms	CHIP_EN rise to RESETN rise	This delay is needed because the XO clock must stabilize before RESETN removal. RESETN must be driven high or low, not left floating.
$t_{A'}$	0	—	ms	VDDIO fall to VBATT fall	VBATT and VDDIO can fall simultaneously or can be tied together. VBATT must not fall before VDDIO.
$t_{B'}$	0	—	ms	CHIP_EN fall to VDDIO fall	VDDIO must not fall before CHIP_EN. CHIP_EN and RESETN can fall simultaneously.
$t_{C'}$	0	—	ms	RESETN fall to VDDIO fall	VDDIO must not fall before RESETN. RESETN and CHIP_EN can fall simultaneously.

7.5 Digital I/O Pin Behavior During Power-up Sequences

The following table represents digital I/O pin states corresponding to device power modes.

Table 7-3. Digital I/O Pin Behavior in Different Device States

Device state	VDDIO	CHIP_EN	RESETN	Output driver	Input driver	Pull up/down resistor (96kΩ)
Power-Down: core supply off	High	Low	Low	Disabled (Hi-Z)	Disabled	Disabled
Power-on Reset: core supply on, hard reset on	High	High	Low	Disabled (Hi-Z)	Disabled	Enabled
Power-On Default: core supply on, the device is out of reset but not programmed yet	High	High	High	Disabled (Hi-Z)	Enabled	Enabled
On Sleep/ On Transmit/ On Receive: core supply on, device programmed by firmware	High	High	High	Programmed by firmware for each pin: Enabled or Disabled	Opposite of Output Driver state	Programmed by firmware for each pin: Enabled or Disabled

7.6 Module Reset

If a module reset is performed, the RESETN pin must be pulsed low for a minimum of 1μ second.

8. Notes On Interfacing to the ATWINC15x0-MR210xB

8.1 Programmable Pull-Up Resistors

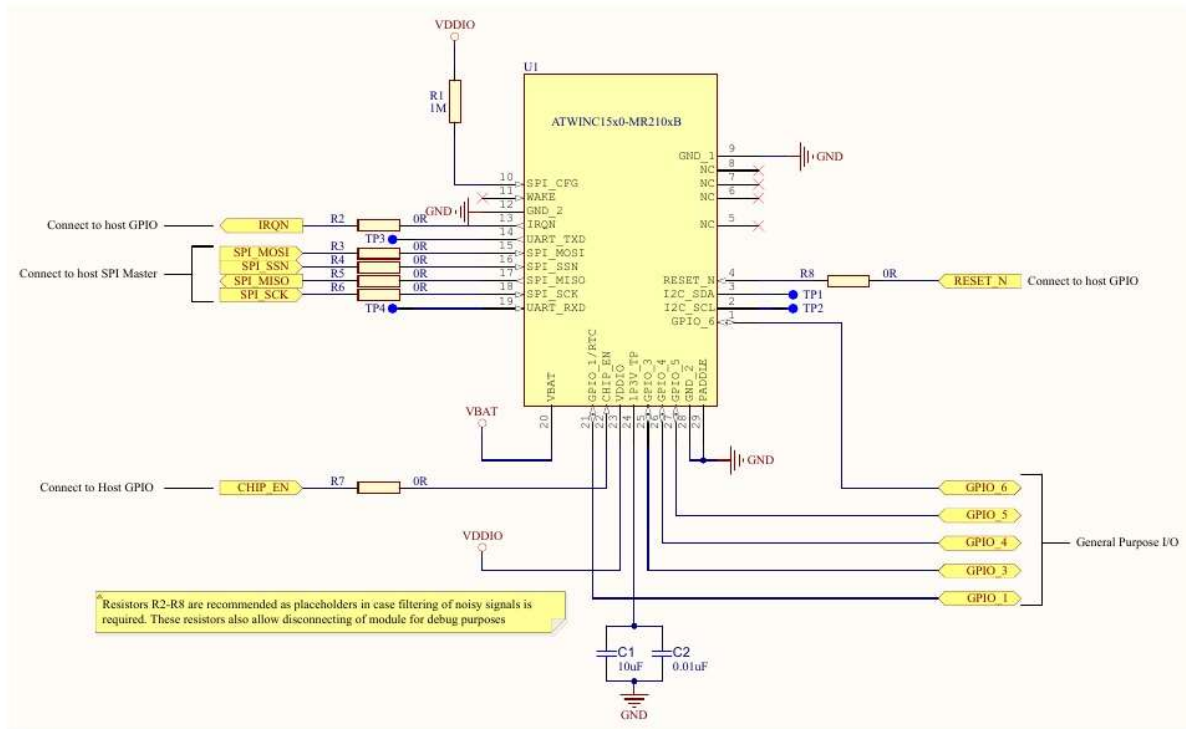
The ATWINC15x0-MR210xB provides programmable pull-up resistors on various pins. The purpose of these resistors is to keep any unused input pins from floating, which can cause excess current to flow through the input buffer from the VDDIO supply. These pull-up resistors must remain enabled on any unused module pin on the ATWINC15x0-MR210xB so the pin will not float. The default state at power-up is for the pull-up resistor to be enabled. However, any pin that is used must have the pull-up resistor disabled. This is because if any pins are driven to a low level while the ATWINC15x0-MR210xB is in the low power sleep state, current will flow from the VDDIO supply through the pull-up resistors, increasing the current consumption of the module. The current through any pull-up resistor that is being driven low will be $VDDIO/100K$ because the value of the pull-up resistor is approximately 100 K Ω . For $VDDIO = 3.3V$, the current through each pull-up resistor that is driven low would be approximately $3.3V/100K = 33 \mu A$. Pins that are used and have had the programmable pull-up resistor disabled must always be actively driven to either a high or low level and not be allowed to float.

9. Schematic Design Information

This section provides schematic information for reference. Application schematics for SPI are provided in the following figure. Module design information, such as module schematics, can be obtained under an NDA from Microchip. These schematics are applicable to the ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules.

9.1 Application Schematic

Figure 9-1. SPI Application Schematic



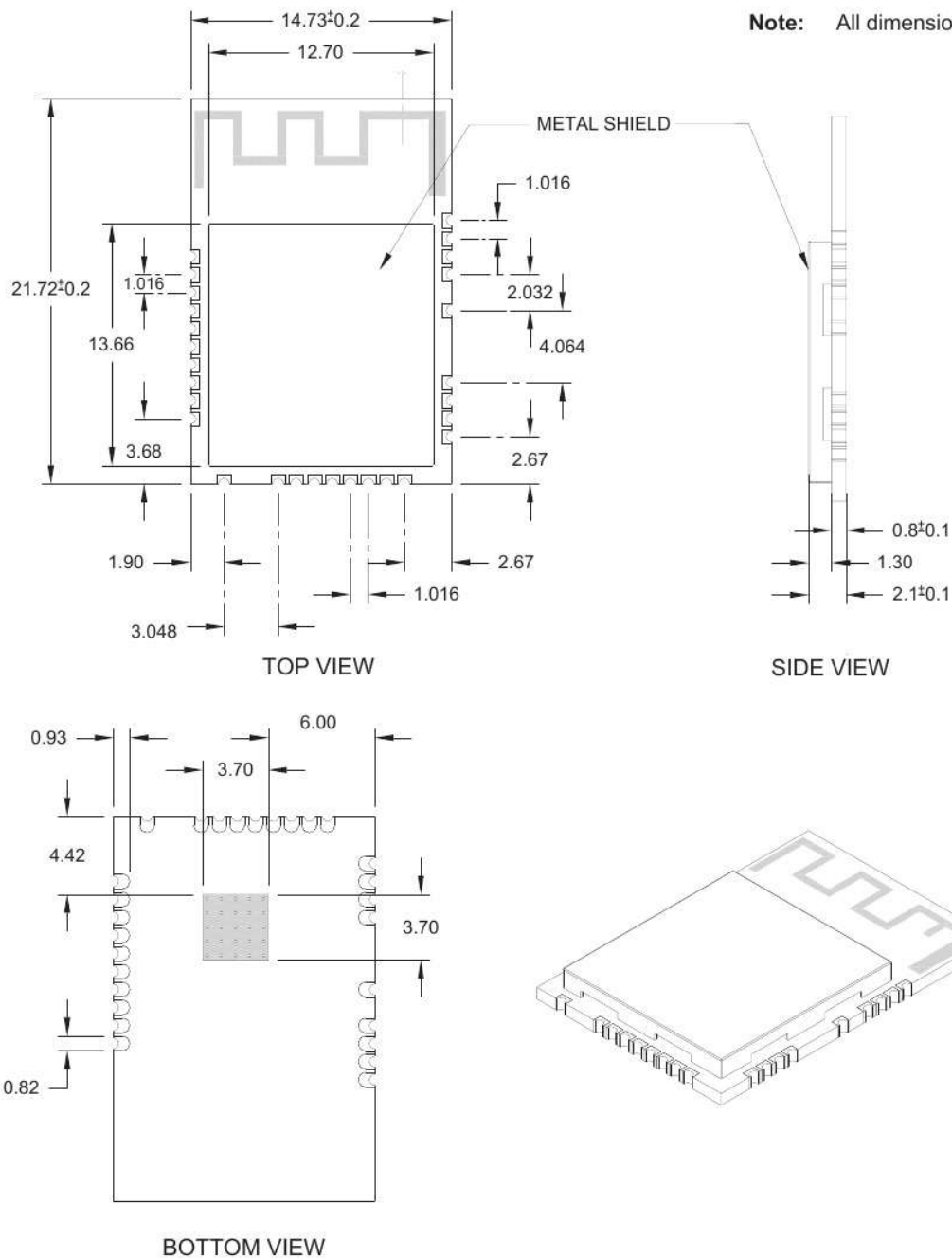
Notes:

1. Add 10 μ F and 0.01 μ F decoupling capacitors very close to pin 24 (1P3V_TP) and GND.
2. U.FL connector feature is available only in the ATWINC1500-MR210UB and ATWINC1510-MR210UB variant.
3. Add either a test point or a connector on pin 14 (UART_TXD), which is used to print the firmware debug logs.
4. Add either a test point or a connector on pin 2 (I2C_SCL) and pin 3 (I2C_SDA), which is used to connect to the MCHPRT2 Radio Test Tool through I2C Aardvark for RF testing.

10. Module Package Drawing

28-Lead PCB Module - 21.72x14.73x2.1 mm Body [Module] ATWINC15x0-MR210PB and ATWILC1000-MR110PB (Package LCB)

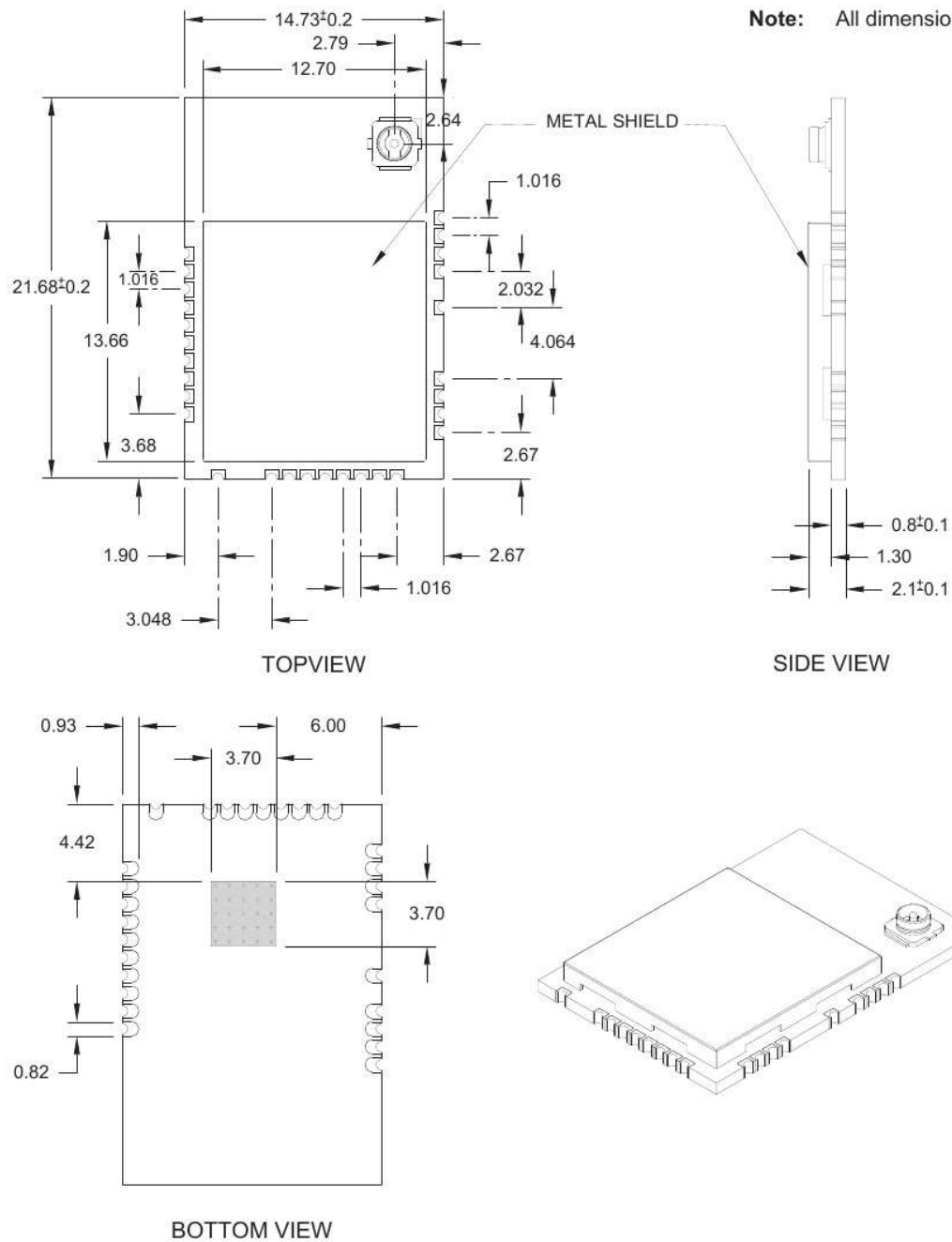
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-21305PB Rev D

**28-Lead PCB Module - 21.72x14.73x2.1 mm Body [Module]
ATWINC15x0-MR210UB and ATWILC1000-MR110UB (Package LFB)**

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



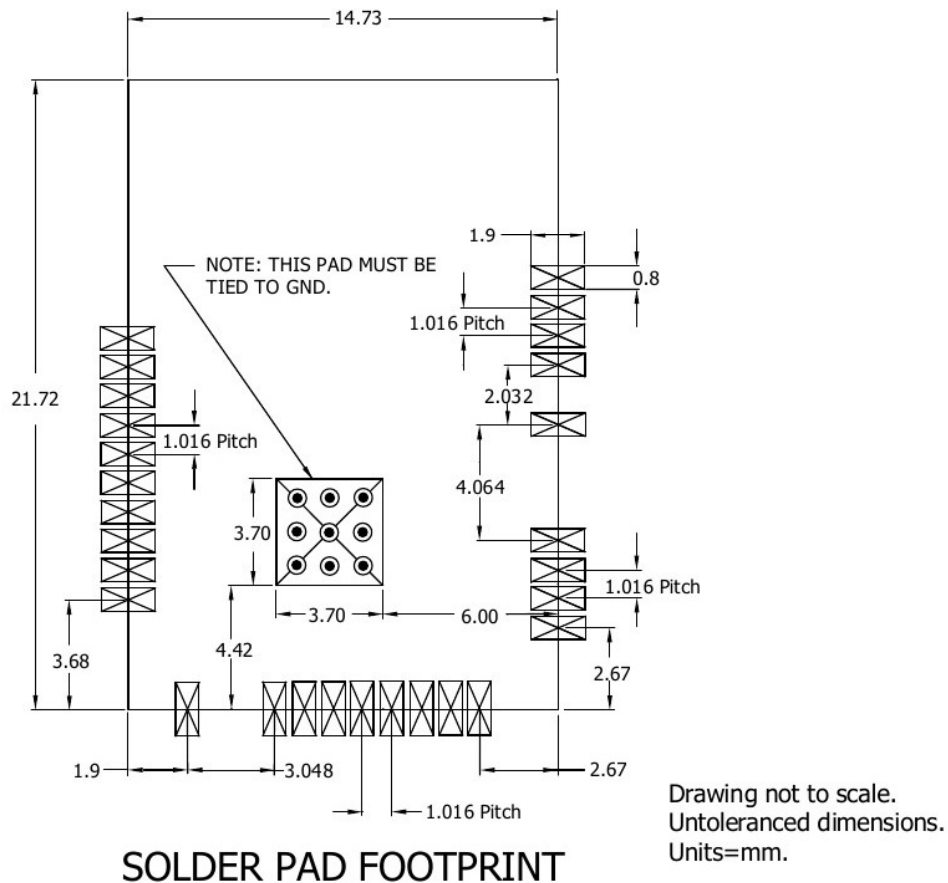
Microchip Technology Drawing C04-21305UB Rev D

10.1 Module Footprint

This section provides the outline drawing for the recommended footprint for the ATWINC15x0-MR210xB module. It is imperative that the center Ground Pad is provided with an array of vias to provide for a good ground and thermal transfer for the ATWINC15x0-MR210xB module.

This footprint is applicable to the ATWINC15x0-MR210xB module devices.

Figure 10-1. Module Solder Pad Footprint (unit = mm)



11. Design Considerations

This section provides the guidelines on placement and routing to achieve the best performance.

11.1 ATWINC15x0-MR210PB Placement and Routing Guidelines

- The module must be placed on the main board – the printed antenna area must overlap with the carrier board. The portion of the module containing the antenna must not go outside the edge of the main board. The antenna is designed to work properly when it is sitting directly on top of a 1.5 mm thick printed circuit board. The following figure shows the best, poor and worst case module placements in the host board.
- If the module is placed at the edge of the host board, a minimum 22 mm by 5 mm area directly under the antenna must be clear of all metal on all layers of the board. “In-land” placement is acceptable; however, the depth of the keep-out area must groove to: module edge to host board edge plus 5 mm.
Note: Do not place the module in the middle of the host board or far away from the host board edge.
- Follow the module placement, keepout and host PCB cutout recommendation as shown in the following figure.
 - Avoid routing any traces in the highlighted region on the top layer of the host board, which is directly below the module area.
 - Follow the electrical keep-out layer recommendation as shown in the following figure. There must not be any copper in any of the layers of the host board in this region. Avoid placing any components (like mechanical spacers, bump, etc.) in the recommended electrical keep-out area.
 - Place the GND polygon pour below the module with the recommended boundary in the top layer of the host board as shown in the following figure. There must not be any breaks in this GND plane.
 - Place sufficient GND vias in the highlighted area below the module for better RF performance.
 - It is recommended to have a 3x3 grid of GND vias solidly connecting the exposed GND paddle of the module to the inner layer ground plane. This acts as a good ground and thermal conduction for the ATWINC15x0-MR210PB module. The GND vias must have a minimum via hole size of 0.3 mm.
 - Follow the mechanical boundary of the host PCB as shown in the the following figure.
- Keep large metal objects away from the antenna to avoid electromagnetic field blocking.
- Do not enclose the antenna within a metal shield.
- Keep any components that may radiate noise or signals within the 2.4 GHz – 2.5 GHz frequency band away from the antenna and if possible, shield those components. Any noise radiated from the host board in this frequency band will degrade the sensitivity of the module.
- Make sure the width of the traces routed to GND, VDDIO and VBAT rails are sufficiently larger for handling the peak TX current consumption.

Figure 11-1. ATWINC15x0-MR210PB Placement Reference

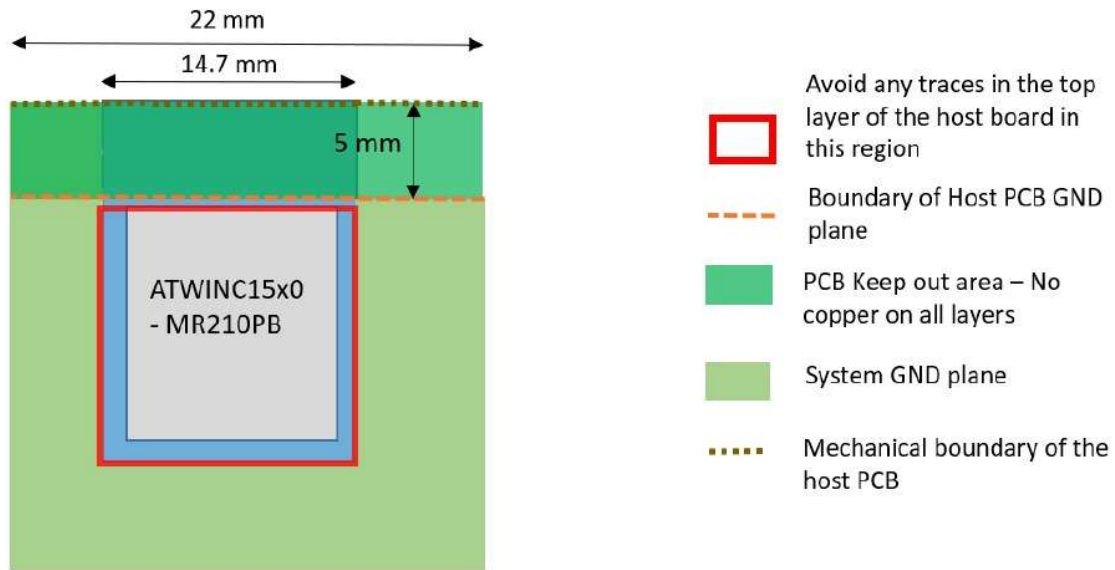
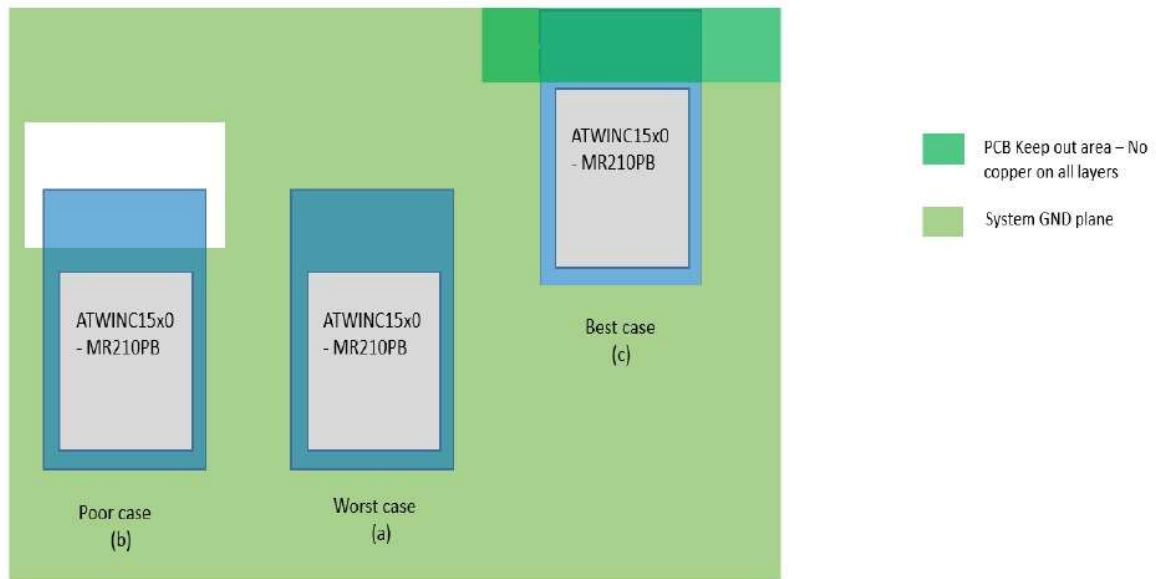


Figure 11-2. ATWINC15x0-MR210PB Placement Example



11.2 Printed PCB Antenna Performance of ATWINC15x0-MR210PB

The printed PCB antenna on the ATWINC15x0-MR210PB is a meandered Inverted F Antenna (IFA). The antenna is fed via matching network that is matched for the module installed on a 1.5 mm thick main board (FR4 substrate material). Main board thickness deviation by ± 1 mm changes RX/TX performance by ± 1 dB maximum, referring to RX/TX performance with a default antenna-matching network and installed on a 1.5 mm thick main board.

Measured peak antenna gain is -0.3 dBi.

Antenna Radiation Pattern

The following figures illustrate the Antenna Radiation Patterns.

Figure 11-3. Antenna Radiation Pattern when $\Phi = 0$ Degree

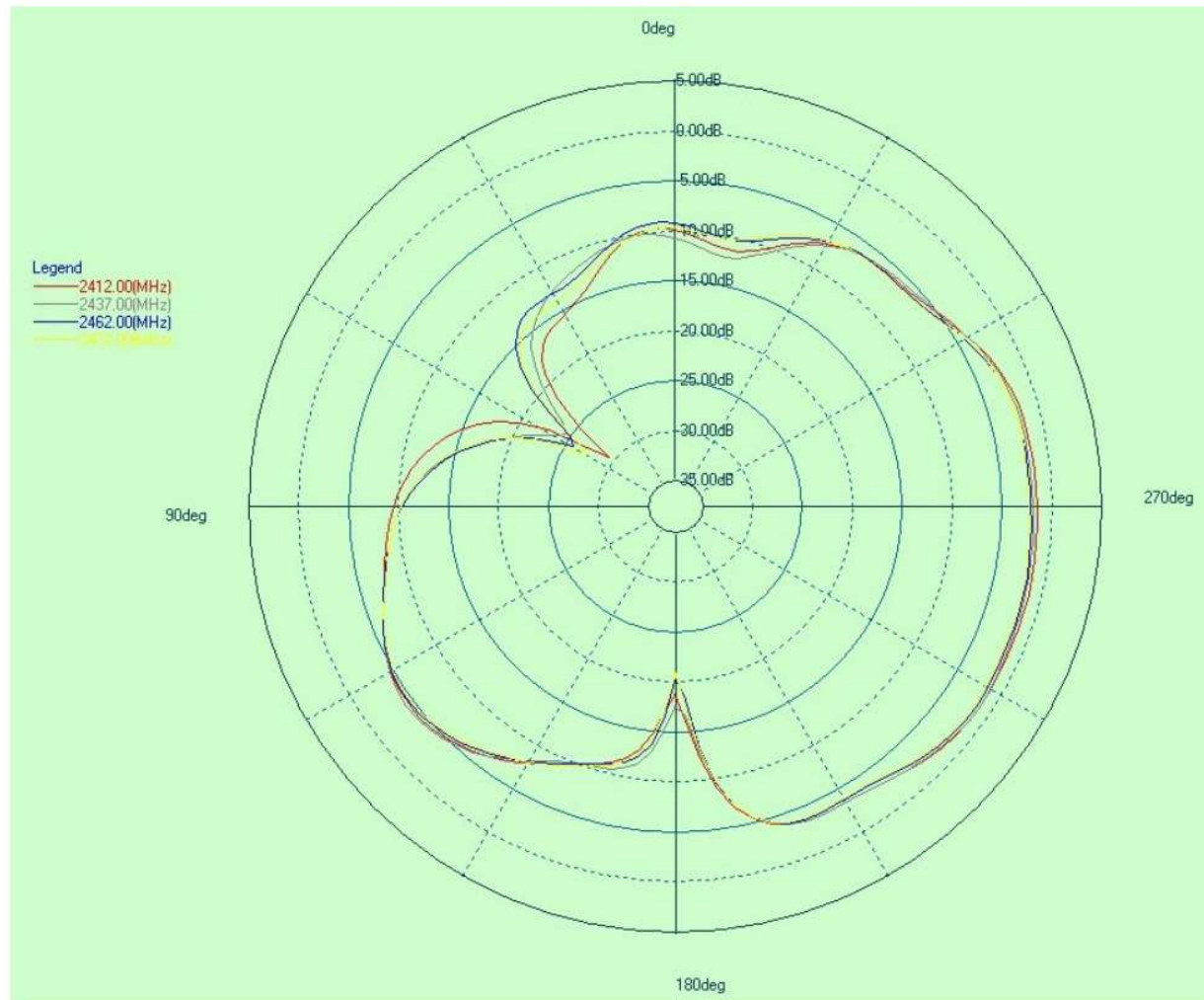


Figure 11-4. Antenna Radiation Pattern when $\Phi = 90$ Degree

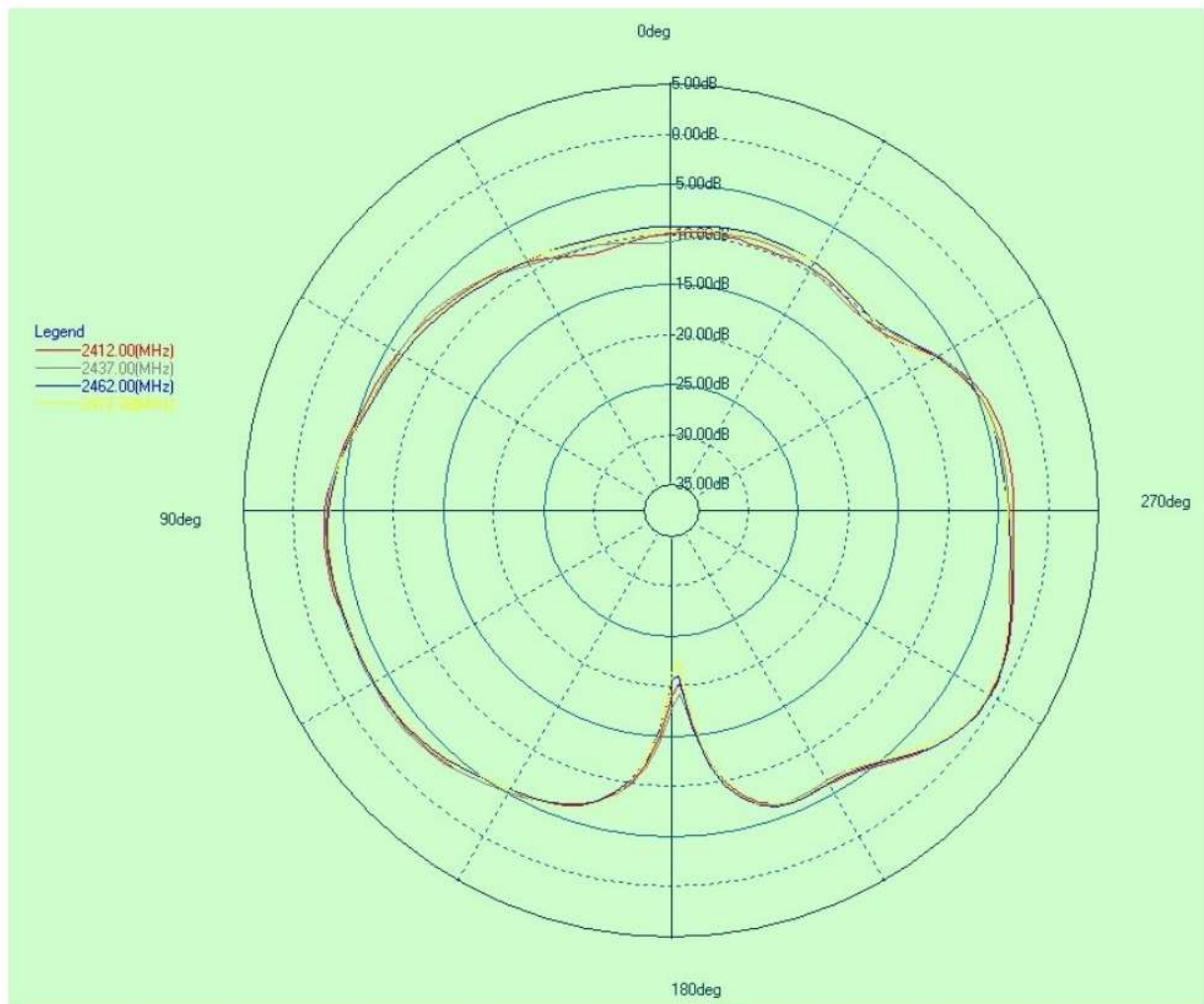
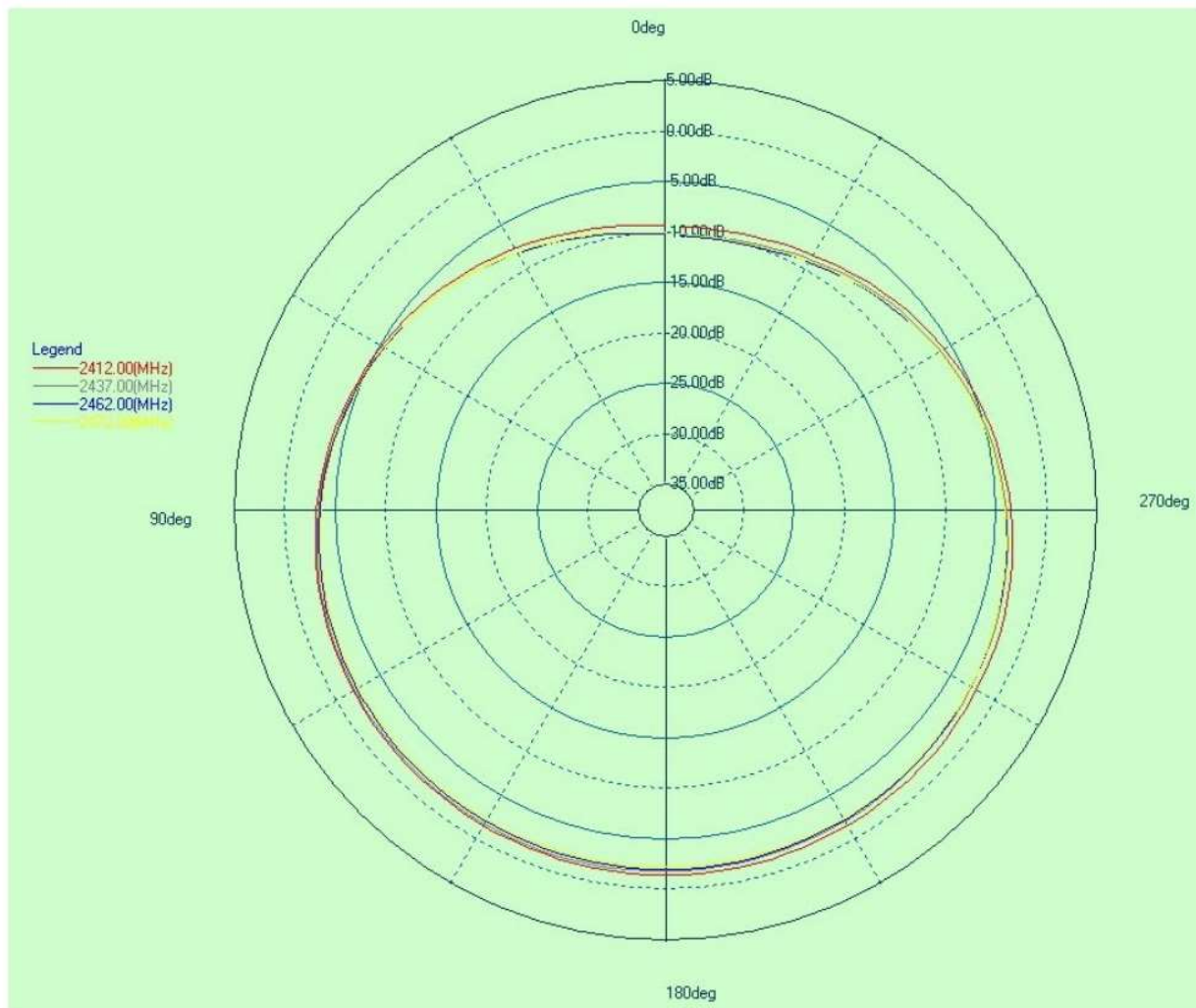


Figure 11-5. Antenna Radiation Pattern when Theta = 90 Degree



11.3 ATWINC15x0-MR210UB Placement and Routing Guidelines

The ATWINC15x0-MR210UB module has an Ultra Small Miniature RF Connector (U.FL) for the external antenna.

The choice of antenna is limited to the antenna types that the module was tested and approved for. For a list of tested and approved antennas that may be used with the module in their respective country, refer to the respective country in [Regulatory Approval](#).

It is critical to follow the recommendations listed below to achieve the best RF performance:

1. Avoid routing any traces on the top layer of the host board that is directly below the module area.
2. Place the GND polygon pour below the complete module area. There must not be any breaks in this GND plane.
3. Place sufficient GND vias in the GND polygon pour below the module area for better RF performance.
4. It is recommended to have a 3x3 grid of GND vias solidly connecting the exposed GND paddle of the module to the inner layer ground plane of the host board. This will act as a good ground and thermal conduction path for the ATWINC15x0-MR210UB module. The GND vias must have a minimum via hole size of 0.3 mm.

5. Keep large metal objects away from the external antenna to avoid electromagnetic field blocking.
6. Do not enclose the external antenna within a metal shield.
7. Keep any components that may radiate noise or signals within the 2.4 GHz – 2.5 GHz frequency band away from the external antenna and if possible, shield those components. Any noise radiated from the host board in this frequency band will degrade the sensitivity of the module.
8. Make sure the width of the traces routed to GND, VDDIO and VBAT rails are sufficiently larger for handling the peak TX current consumption.

11.4 Recommended External Antenna for ATWINC15x0-MR210UB

The ATWINC15x0-MR210UB module is approved to use with the antennas listed in the following table. It is permissible to use a different antenna, provided the same antenna type, antenna gain (equal or less than) and similar in-band and out-of-band characteristics are present (refer to the specification sheet for cutoff frequencies). If other antenna types are used, the OEM installer must conduct the necessary assessments and authorize the antenna with respective regulatory agencies and ensure compliance. Refer to the corresponding regulatory approval sections under [Regulatory Approval](#) for further guidance.

Table 11-1. ATWINC15x0-MR210UB Approved External Antenna Table with Antenna Gain^(1, 2, 3)

List Item	Part Number	Manufacturer	Antenna Gain at 2.4 GHz band	Antenna type	ATWINC15x0-MR210UB	
					FCC/ISED	CE
1	RFA-02-P33	Aristotle	2	PCB	X	X
2	RFA-02-D3	Aristotle	2	Dipole	X	X
3	RFA-02-G03	Aristotle	2	Metal Stamp	X	X
4	RFA-02-L2H1	Aristotle	2	Dipole	X	X
5	RFA-02-P05	Aristotle	2	PCB	X	X
6	RFA-02-C2M2	Aristotle	2	Dipole	X	X
7	86254	Delock	2	PCB	—	X
8	W3525B039	Pulse Electronics	2	PCB	X	X
9	RFDPA870920IM LB301	WALSIN	1.84	Dipole	X	X
10	RN-SMA-S	Microchip	0.56	Dipole	X	X

Notes:

1. X = Antennas covered under the certification
2. If the end product using the Module is designed to have an antenna port that is accessible to the end user, RP (Reverse Polarity)-SMA socket must be used.
3. If an RF coaxial cable is used between the module RF output and the enclosure, an RP-SMA connector must be used in the enclosure wall for interface with the antenna.
4. Contact the antenna vendor for detailed antenna specifications to review the suitability to the end-product operating environment and to identify alternatives.

11.4.1 Antenna Placement Recommendations for ATWINC15x0-MR210UB

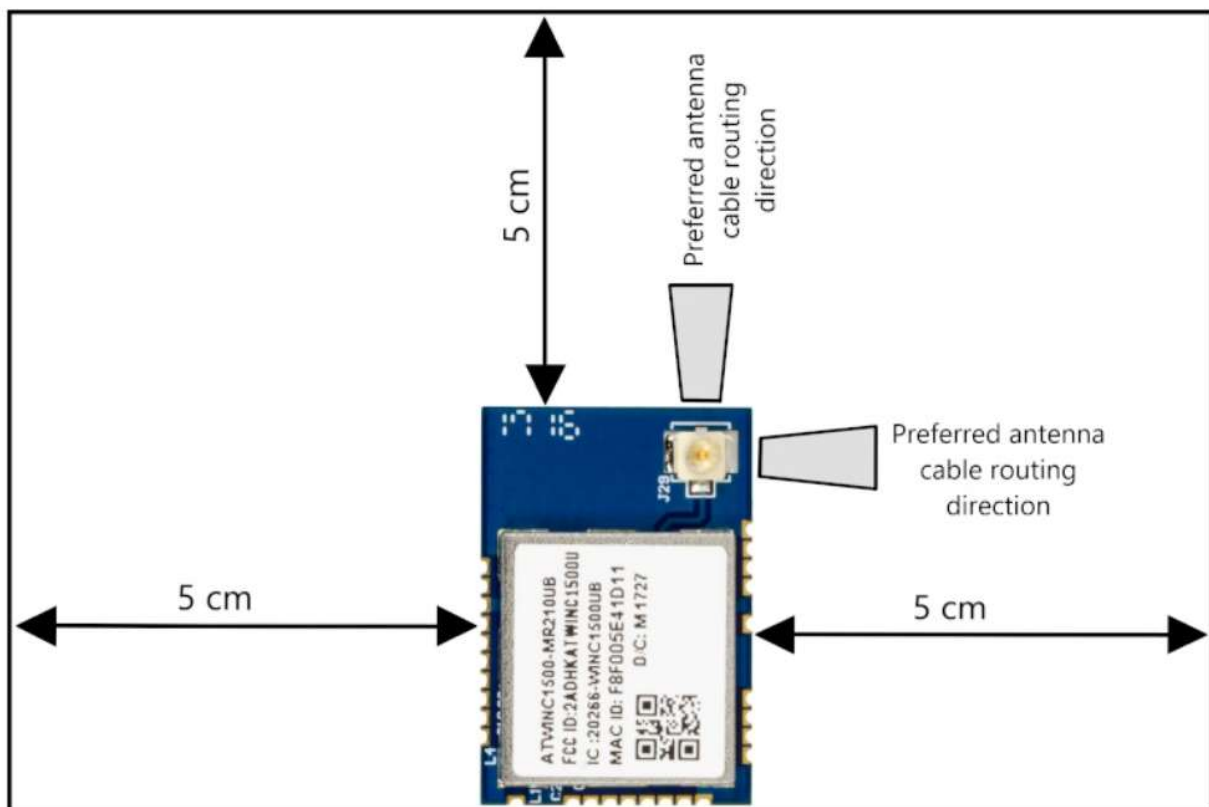
The following recommendations must be applied for the placement of the antenna and its cable:

- The antenna cable must not be routed over circuits generating electrical noise on the host board or alongside or underneath the module. It is preferred that the cable be routed straight out of the module.

- The antenna must not be placed in direct contact or in close proximity of the plastic casing/objects.
- Do not enclose the antenna within a metal shield.
- Keep any components which may radiate noise, signals or harmonics within the 2.4 GHz to 2.5 GHz frequency band away from the antenna and, if possible, shield those components. Any noise radiated from the host board in this frequency band degrades the sensitivity of the module.
- The antenna should preferably be placed at a distance greater than 5 cm away from the module. The following figure shows the antenna keep-out area indication; where the antenna must not be placed in this area. This recommendation is based on an open-air measurement and does not take into account any metal shielding of the customer end product. When a metal enclosure is used, the antenna can be located closer to the ATWINC15x0-MR210UB module.

The drawing below provides an indication of how the antenna cable should be routed depending on the location of the antenna with respect to the ATWINC15x0-MR210UB PCB. There are two possible options for the optimum routing of the cable.

Figure 11-6. ATWINC15x0-MR210UB Antenna Placement Guidelines



Note: These are generic guidelines and it is recommended that customers check and fine-tune the antenna positioning in the final host product based on RF performance.

11.5 Module Assembly Considerations

The ATWINC15x0-MR210xB modules are assembled with an EMI Shield to ensure compliance with EMI emission and immunity rules. The EMI shield is made of a tin-plated steel (SPTE) and is not hermetically sealed. Solutions like IPA and similar solvents can be used to clean the ATWINC15x0-MR210xB module. However, cleaning solutions that contain acid must never be used on the module.

11.6 Conformal Coating

The modules are not intended for use with a conformal coating and the customer assumes all risks (such as the module reliability, performance degradation and so on) if a conformal coating is applied to the modules.

11.7 Reflow Profile Information

For information on the reflow process guidelines, refer to the “Solder Reflow Recommendation” Application Note ([AN233](#)).

12. Regulatory Approval

The ATWINC15x0-MR210xB module has received regulatory approval from the following countries:

- ATWINC1500-MR210PB
 - United States/FCC ID: 2ADHKATWINC1500
 - Canada
 - IC ID: 20266-WINC1500PB
 - HVIN: ATWINC1500-MR210PB
 - PMN: ATWINC1500-MR210PB
 - Europe: CE
 - Japan/MIC: 005-101762
 - Korea/KCC: R-CRM-mcp-WINC1510MR210P
 - Taiwan/NCC: CCAN18LP0321T2
 - China/SRRC: CMIIT ID: 2018DJ1305
 - ANATEL: 08497-18-08759
- ATWINC1510-MR210PB
 - United States/FCC ID: 2ADHKATWINC1510
 - Canada
 - IC ID: 20266-ATWINC1510
 - HVIN: ATWINC1510-MR210PB
 - PMN: ATWINC1510-MR210PB
 - Europe: CE
 - Japan/MIC: 005-101762
 - Korea/KCC: R-CRM-mcp-WINC1510MR210P
 - Taiwan/NCC: CCAN18LP0320T0
 - China/SRRC: CMIIT ID: 2018DJ1310
 - ANATEL: 08497-18-08759
- ATWINC1500-MR210UB
 - United States/FCC ID: 2ADHKATWINC1500U
 - Canada
 - IC ID: 20266-WINC1500UB
 - HVIN: ATWINC1500-MR210UB
 - PMN: ATWINC1500-MR210UB
 - Europe: CE
 - ANATEL: 08497-18-08759
- ATWINC1510-MR210UB
 - United States/FCC ID: 2ADHKATWINC1500U
 - Canada
 - IC: 20266-WINC1500UB
 - HVIN: ATWINC1510-MR210UB
 - PMN: ATWINC1510-MR210UB

- Europe: CE
- ANATEL: 08497-18-08759

Gain Table for Individual Regulatory Region

The default firmware uses a common gain table that meets IEEE 802.11 specifications and regulatory regions (ATWINC15x0-MR210PB – United States/FCC, Canada/ISED, Europe/CE, Japan/MIC, Korea/KCC, Taiwan/NCC and China/SRRC; ATWINC15x0-MR210UB – United States/FCC, Canada/ISED and Europe/CE). In some cases, the output power is limited by the regulatory region with the most stringent transmit power limits. If the end product's destination is known, the region-specific gain table can optionally be embedded into the firmware to optimize performance.

The application gain table for individual regulatory region is available on ATWINC15x0-MR210PB and ATWINC15x0-MR210UB product page. Customers can update the gain table in firmware by following the instructions in section 6. Updating Application Gain Table into ATWINC15x0 of ATWINC15x0 – *Deriving Application Gain Table Application Note*.

Note: The users in Brazil must ensure that application gain table for Brazil is embedded into the firmware. The application gain table for Brazil/ANATEL is available on ATWINC15x0-MR210PB product page.

12.1 United States

The ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules have received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” single-modular approval in accordance with Part 15.212 Modular Transmitter approval. Single-modular transmitter approval is defined as a complete RF transmission sub-assembly, designed to be incorporated into another device, that must demonstrate compliance with FCC rules and policies independent of any host. A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that specific module or limited module device.

The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

A host product itself is required to comply with all other applicable FCC equipment authorization regulations, requirements, and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators (Part 15 Subpart B), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Suppliers Declaration of Conformity (SDoC) or certification) as appropriate (e.g., Bluetooth and Wi-Fi transmitter modules may also contain digital logic functions).

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

12.1.1 Labeling and User Information Requirements

The ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules have been labeled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must display a label referring to the enclosed module. This exterior label must use the following wording:

- For ATWINC1500-MR210PB:

Contains Transmitter Module FCC ID: 2ADHKATWINC1500 or Contains FCC ID: 2ADHKATWINC1500 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.
For ATWINC1510-MR210PB
Contains Transmitter Module FCC ID: 2ADHKATWINC1510 or Contains FCC ID: 2ADHKATWINC1510 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.
For ATWINC1500-MR210UB
Contains Transmitter Module FCC ID: 2ADHKATWINC1500U or Contains FCC ID: 2ADHKATWINC1500U 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.
For ATWINC1510-MR210UB
Contains Transmitter Module FCC ID: 2ADHKATWINC1500U or Contains FCC ID: 2ADHKATWINC1500U 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.

The user's manual for the finished product must include the following 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

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748, which is available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) apps.fcc.gov/oetcf/kdb/index.cfm.

12.1.2 RF Exposure

All transmitters regulated by FCC must comply with RF exposure requirements. KDB 447498 General RF Exposure Guidance provides guidance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC).

From the FCC Grant: Output power listed is conducted. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification.

The antenna(s) used with this transmitter must be installed to provide a separation distance of at least 6.5 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

12.1.3 Approved Antenna Types

To maintain modular approval in the United States, only the antenna types that have been tested shall be used. It is permissible to use different antenna provided the same antenna type and antenna gain (equal to or less than) is used. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.

For the ATWINC15x0-MR210PB, the approval is received using the integral PCB antenna.

For the ATWINC15x0-MR210UB, approved antennas are listed in the [Recommended External Antenna for ATWINC15x0-MR210UB](#).

12.1.4 Helpful Web Sites

- Federal Communications Commission (FCC): www.fcc.gov.
- FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) apps.fcc.gov/oetcf/kdb/index.cfm.

12.2 Canada

The ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules have been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247. Modular approval permits the installation of a module in a host device without the need to recertify the device.

12.2.1 Labeling and User Information Requirements

Labeling Requirements (from RSP-100 - Issue 12, Section 5): The host product shall be properly labeled to identify the module within the host device.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host device; otherwise, the host product must be labeled to display the Innovation, Science and Economic Development Canada certification number of the module, preceded by the word "Contains" or similar wording expressing the same meaning, as follows:

• For ATWINC1500-MR210PB
Contains IC: 20266-WINC1500PB
• For ATWINC1510-MR210PB
Contains IC: 20266-ATWINC1510
• For ATWINC1500-MR210UB
Contains IC: 20266-WINC1500UB

- For ATWINC1510-MR210UB

Contains IC: 20266-WINC1500UB

User Manual Notice for License-Exempt Radio Apparatus (from Section 8.4 RSS-Gen, Issue 5, March 2019): User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference;

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;

2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (From Section 6.8 RSS-GEN, Issue 5, March 2019): User manuals, for transmitters shall display the following notice in a conspicuous location:

This radio transmitter [IC: 20266-WINC1500PB, IC: 20266-ATWINC1510, IC: 20266-WINC1500UB and IC: 20266-WINC1500UB] has been approved by Innovation, Science and Economic Development Canada 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.

Le présent émetteur radio [IC: 20266-WINC1500PB, IC: 20266-ATWINC1510, IC: 20266-WINC1500UB and IC: 20266-WINC1500UB] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés cidessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi) and required impedance for each.

12.2.2 RF Exposure

All transmitters regulated by Innovation, Science and Economic Development Canada (ISED) must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).

This transmitter is restricted for use with a specific antenna tested in this application for certification, and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with Canada multi-transmitter product procedures.

The installation of the transmitter must ensure that the antenna has a separation distance of at least 6.5 cm from all persons or compliance must be demonstrated according to the ISED SAR procedures.

12.2.3 Approved Antenna Types

For the ATWINC15x0-MR210PB, the approval is received using the integral PCB antenna.

For the ATWINC15x0-MR210UB, approved antennas are listed in the [Recommended External Antenna for ATWINC15x0-MR210UB](#).

12.2.4 Helpful Web Sites

Innovation, Science and Economic Development Canada (ISED): www.ic.gc.ca/.

12.3 Europe

The ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules is/are a Radio Equipment Directive (RED) assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules has/have been tested to RED 2014/53/EU Essential Requirements mentioned in the following European Compliance table.

Table 12-1. European Compliance

Certification	Standards	Article
Safety	EN 62368	3.1a
Health	EN 62311	
EMC	EN 301 489-1	3.1b
	EN 301 489-17	
Radio	EN 300 328	3.2

The ETSI provides guidance on modular devices in the *"Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the RED 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment"* document available at http://www.etsi.org/deliver/etsi_eg/203300_203399/20_3367/01.01.01_60/eg_203367v010101p.pdf.

Note: To maintain conformance to the standards listed in the preceding European Compliance table, the module shall be installed in accordance with the installation instructions in this data sheet and shall not be modified. When integrating a radio module into a completed product, the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements against the RED.

12.3.1 Labeling and User Information Requirements

The label on the final product that contains the ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules must follow CE marking requirements.

12.3.2 Conformity Assessment

From ETSI Guidance Note EG 203367, section 6.1, when non-radio products are combined with a radio product:

If the manufacturer of the combined equipment installs the radio product in a host non-radio product in equivalent assessment conditions (i.e. host equivalent to the one used for the assessment of the radio product) and according to the installation instructions for the radio product, then no additional assessment of the combined equipment against article 3.2 of the RED is required.

12.3.2.1 Simplified EU Declaration of Conformity

Hereby, Microchip Technology Inc. declares that the radio equipment type ATWINC1500-MR210PB, ATWINC1510-MR210PB, ATWINC1500-MR210UB and ATWINC1510-MR210UB modules is/are in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity for this product is available at <http://www.microchip.com/ATWINC1500> (available under Documents > Certifications).

12.3.3 Approved Antenna Types

For the ATWINC15x0-MR210PB, the approval is received using the integral PCB antenna.

For the ATWINC15x0-MR210UB, approved antennas are listed in the [Recommended External Antenna for ATWINC15x0-MR210UB](#).