Atmel

# ZIGBIT 900MHZ WIRELESS MODULES

## ATZB-X0-256-4-0-CN

## DATASHEET

### Features

- Compact size (38.5 x 20.0mm)
- High RX sensitivity (-103dBm)
- Outperforming link budget (up to +112dB)
- Up to +9.0dBm output power
- Very low power consumption:
  - 8.7mA in RX mode (1)
  - 34.8mA in TX mode (1)
  - 0.6µA in sleep mode (2)
- Ample memory resources (256KB In-System, Self-Programmable Flash memory, 4KB EEPROM, 16KB SRAM)
- Wide range of interfaces (both analog and digital)
  - 4-wire SPI, TWI
  - ISP, JTAG
  - Two analog comparator input
  - UART, USART
  - Timer, PWM
  - Four ADC lines
  - External Clock Input, Internal Clock Output
  - Up to 32 lines configurable as GPIO
- Preassigned Atmel® MAC address that can be used on end product
- Capability to use MAC address into the internal EEPROM
- IEEE® 802.15.4 compliant Transceiver
- 900MHz ISM band
- Serial bootloader
- High Performance Low Power Atmel AVR® XMEGA® 8- and 32-bit Microcontroller
- Rapid design-in with built-in Chip Antenna
- RF Test point using MS-147 RF connector
- Small physical footprint and low profile for optimum fit in very small application boards
- Mesh networking capability
- Easy-to-use low cost development kit
- Single source of support for HW and SW
- Worldwide license-free operation

Notes:
1. MCU is in active state with 3V Supply, CPU clock @ 16MHz, RX RPC enabled (for RX current), PHY_TX_PWR=0x0 (for TX current), All digital outputs pulled high.
2. Controller Sleep Mode: SLEEP_MODE_PWR_DOWN.

# Table of Contents

# 1. Introduction

## 1.1 Summary

ATZB-X0-256-4-0-CN ZigBit® is an ultra-compact and low-power 900MHz IEEE 802.15.4/ZigBee® OEM module from Atmel. Based on the innovative mixed-signal hardware platform from Atmel, this module uses the ATxmega256A3U [1] Microcontroller and AT86RF212B [5] 700/800/900MHz ISM band Transceiver. The radio transceiver provides high data rates from 20kb/s up to 1Mb/s, frame handling, outstanding receiver sensitivity and high transmit output power enabling a very robust wireless communication. The module is designed for wireless sensing, monitoring, control, data acquisition applications, to name a few. This ZigBit module eliminates the need for costly and time-consuming RF development, and shortens time-to-market for wireless applications.

The module has an MS-147 RF connector that can be used as an RF test port. The built-in chip antenna is designed and tuned for the ZigBit design to enable quick integration of the ZigBit into any application.

## 1.2 Applications

The ZigBit module is compatible with robust IEEE 802.15.4/ZigBee stack that supports a self-healing, self-organizing mesh network, while optimizing network traffic and minimizing power consumption.

For detailed software support information, visit http://www.atmel.com/products/wireless.

The applications include, but are not limited to:

- Building automation and monitoring
  - Lighting controls
  - Wireless smoke- and CO-detectors
  - Structural integrity monitoring
- HVAC monitoring and control
- Inventory management
- Environmental monitoring
- Security
- Water metering
- Industrial monitoring
  - Machinery condition and performance monitoring
  - Monitoring of plant system parameters such as temperature, pressure, flow, tank level, humidity, vibration, etc.
- Automated meter reading (AMR)

## 1.3 Abbreviations and Acronyms

| | |
|---|---|
| ADC | Analog-to-Digital Converter |
| API | Application Programming Interface |
| DC | Direct Current |
| DTR | Data Terminal Ready |
| EEPROM | Electrically Erasable Programmable Read-Only Memory |
| ESD | Electrostatic Discharge |
| GPIO | General Purpose Input/output |
| HAF | High Frequency |
| HVAC | Heating, Ventilating, and Air Conditioning |

| | |
|---|---|
| HW | Hardware |
| $I^2C$ | Inter-Integrated Circuit |
| IEEE | Institute of Electrical and Electronics Engineers |
| IRQ | Interrupt Request |
| ISM | Industrial, Scientific and Medical radio band |
| JTAG | Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface |
| MAC | Medium Access Control layer |
| MCU | Microcontroller Unit. In this document it also means the processor, which is the core of a ZigBit module |
| NRE | Network layer |
| OEM | Original Equipment Manufacturer |
| OTA | Over-The-Air upgrade |
| PA | Power Amplifier |
| PCB | Printed Circuit Board |
| PER | Package Error Ratio |
| RAM | Random Access Memory |
| RF | Radio Frequency |
| RPC | Reduced Power Consumption |
| RTS/CTS | Request to Send/ Clear to Send |
| RX | Receiver |
| SMA | Surface Mount Assembly |
| SoC | System on Chip |
| SPI | Serial Peripheral Interface |
| SW | Software |
| TTM | Time-To-Market |
| TX | Transmitter |
| UART | Universal Asynchronous Receiver/Transmitter |
| USART | Universal Synchronous/Asynchronous Receiver/Transmitter |
| USB | Universal Serial Bus |
| ZigBee, ZigBee PRO | Wireless networking standards targeted at low-power applications |
| 802.15.4 | The IEEE 802.15.4-2003 standard applicable to low-rate wireless Personal Area Network |

## 1.4 Related Documents

[1] ATXMEGA256A3U Datasheet in http://www.atmel.com/devices/ATXMEGA256A3U.aspx?tab=documents.

[2] MS-147 Series Interface RF Connector with Switch, 3.9mm High, DC to 6GHz http://www.hirose.co.jp/cataloge_hp/e35801505.pdf.

[3] IEEE Std 802.15.4-2003 IEEE Standard for Information technology - Part 15.4 Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs).

[4] ZigBee Specification. ZigBee Document 053474r17, October 19, 2007.

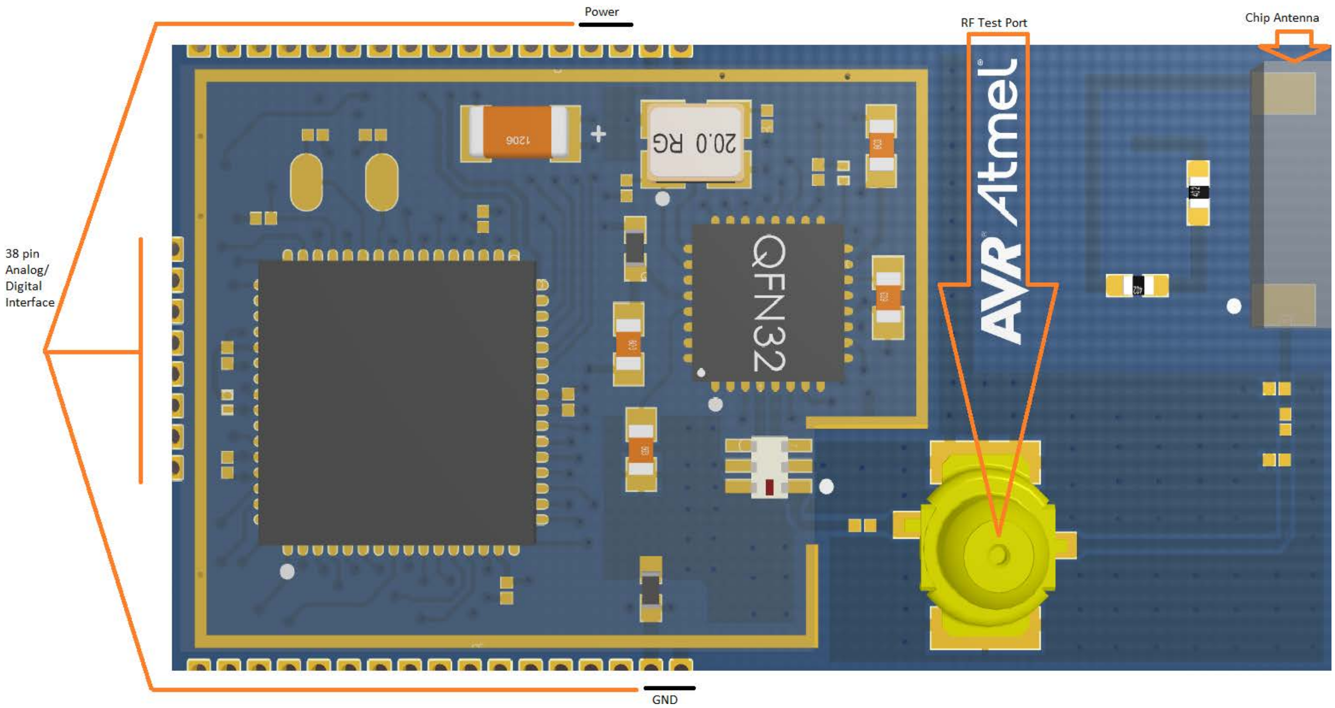
[5] AT86RF212B Datasheet in http://www.atmel.com/devices/AT86RF212B.aspx?tab=documents.

# 2. ZigBit Module Overview

## 2.1 Overview

The ATZB-X0-256-4-0-CN ZigBit is a compact, low-power, high sensitivity IEEE 802.15.4/ZigBee OEM module. Based on a solid combination of the latest Atmel MCU Wireless hardware platform, 900MHz ISM band transceiver and Atmel Studio Wireless Composer - the ZigBit offers an unmatched combination of superior radio performance, ultra-low power consumption and exceptional ease of integration.

**Figure 2-1. ATZB-X0-256-4-0-CN User Interface Diagram**




This ZigBit module contains the Atmel ATxmegaA256A3U Microcontroller and AT86RF212B 900MHz ISM band Transceiver for ZigBee and IEEE 802.15.4 [3]. The module features 256KB In-System Self-Programmable flash memory, 16KB SRAM and 4KB EEPROM.

The compact all-in-one board design of MCU and Radio Transceiver with very minimal components on the RF path to Antenna dramatically improves the ZigBit's compact size, range performance on signal transmission and increases its sensitivity. This ensures stable connectivity within a larger coverage area, and helps develop applications on smaller footprint. The MS-147 connector [2] can be used as an RF Test port.

ZigBit Module contains a complete RF/MCU design with all the necessary passive components included. The module can be easily mounted on a simple 2-layer PCB with a minimum of required external connection. The ZigBit Module Evaluation kit containing the ZigBit Extension board for the Atmel Xplained PRO HW Evaluation platform can be used to develop FW using the Atmel Studio and evaluate using the Wireless Composer. Compared to a custom RF/MCU solution, a module-based solution offers considerable savings in development time and NRE cost per unit during the HW/FW design, prototyping, and mass production phases of product development.

All ZigBits are preloaded with a Bootloader when they are sold as Modules, either in Single units or T&R.

Depending on end-user design requirements, the ZigBit can operate as a self-contained sensor node, where it would function as a single MCU, or it can be paired with a host processor driving the module over a serial interface.

The MAC stack running on the host processor can then control data transmission and manages module peripherals. Thus very minimal firmware customization is required for successful module design-in. Third-party sensors can then be connected directly to the module, thus expanding the existing set of peripheral interfaces.

Every ZigBit Module come pre loaded with Atmel assigned 64-bit MAC address stored in the signature bytes of the device. This unique IEEE MAC address can be used as the MAC address of the end product, so there is no need to buy a MAC address separately for the product using the ZigBit.

# 3. Specifications

## 3.1 Electrical Characteristics

### 3.1.1 Absolute Maximum Ratings

**Table 3-1. Absolute Maximum Ratings** [1][2]

| Parameter | Minimum | Maximum |
|---|---|---|
| Voltage on any pin, except RESET with respect to ground | -0.3V | 3.6V ($V_{DD\ max}$) |
| Input RF level | | +10dBm |
| Current into $V_{CC}$ pins | | 200mA |

Notes:
1. Absolute Maximum Ratings are the values beyond which damage to the device may occur. Under no circumstances must the absolute maximum ratings given in this table be violated. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.
   This is a stress rating only. Functional operation of the device at these or other conditions, beyond those indicated in the operational sections of this specification, is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. **Attention!** ZigBit is an ESD-sensitive device. Precaution should be taken when handling the device in order to prevent permanent damage.

### 3.1.2 Power Supply

**Table 3-2. Test Conditions (unless otherwise stated), $V_{cc}$ = 3V, $T_{amb}$ = 25°C**

| Parameter | Range | Unit |
|---|---|---|
| Supply voltage, $V_{DD}$ | 1.8 to 3.6 | V |
| Active Current consumption: RX mode + Max sensitivity | 14.5 | mA |
| Active Current consumption: RX mode + Least sensitivity | 13.9 | mA |
| Active Current consumption: RX mode + Max sensitivity, MCU Sleep [2] | 9.3 | mA |
| Active Current consumption: RX mode + Least sensitivity, MCU Sleep [2] | 8.7 | mA |
| Active Current consumption: TX mode [1] – BUSY_TX – Transmit state | 34.8 | mA |
| Current consumption: TRX_OFF, MCU Active | 6.1 | mA |
| Current consumption: TRX_OFF, MCU Sleep [2] | 740 | μA |
| Sleep Current consumption: TRX Sleep, MCU Sleep [2] | 0.6 | μA |

Note 1: Output TX power (when measuring consumption in TX mode) is +9dBm.

Note 2:

a) All interfaces are set to the default state (see Table 3-8 Pinout Description).

b) JTAG is not connected.

c) CPU Clock configured when doing this measurement – 16MHz for all modes except Power save and Power down modes.

Current consumption depends on multiple factors, including but not limited to, the board design and materials, Protocol settings, network activity, EEPROM read/write operations. It also depends on MCU load and/or peripherals used by an application.

### 3.1.3 RF Characteristics

**Table 3-3. RF Characteristics** [3]

| Parameter | Condition | Range | Unit |
|---|---|---|---|
| Frequency band – FCC and Industry Canada [2] | | 902 – 928 | MHz |
| Numbers of channels (FCC and Industry Canada) | | 10 | |
| Channel spacing | | 2 | MHz |
| Transmitter output power | Adjusted in 36 steps | -25 to +11 | dBm |
| Receiver sensitivity | PER = 1% | -103 | dBm |
| On-air data rate | | 20, up to 1000 | Kbps |
| TX output/ RX input nominal impedance | For balanced | 50 | Ω |
| Range [1] | Open field, LoS, Elevated | 1120 | m |

Notes:
1. Range measured is Line of Sight at 10ft elevation from Ground at different combinations of orientation of transmitter and receiver, with special conditions were there is minimal or no RF interference from other sources. For best case orientation of the ZigBits to achieve maximum range, refer to Section 3.4.
2. Appropriate FW (Register selection) must be used for operating this ZigBit in North America.
3. For detailed characteristics, refer to [2].

**Table 3-4. TX Power Settings**

| PHY_TX_PWR 3:0 Register value | Power register setting [dBm] | Output power [dBm] (typical values at RF connector) |
|---|---|---|
| C0 | 11 | 8.59 |
| C1 | 10 | 8.14 |
| 80 | 9 | 7.43 |
| 82 | 8 | 5.85 |
| 83 | 7 | 4.97 |
| 84 | 6 | 4.1 |
| 40 | 5 | 3.58 |
| 86 | 4 | 2.12 |
| 00 | 3 | 1.4 |
| 01 | 2 | 0.42 |
| 02 | 1 | -0.93 |
| 03 | 0 | -2.09 |
| 04 | -1 | -3.16 |
| 27 | -2 | -4.29 |
| 91 | -6 | -7.86 |
| 0D | -10 | -12.27 |
| 15 | -18 | -19.51 |
| 1D | -25 | -26.82 |

### 3.1.4 ATxmega256A3U Microcontroller Characteristics

**Table 3-5. ATxmega256A3U Characteristics**

| Parameter | Range | Unit |
|---|---|---|
| On-chip flash memory size | 256K | Bytes |
| On-chip RAM size | 16K | Bytes |
| On-chip EEPROM size | 4K | Bytes |
| Operation frequency | 16 | MHz |

### 3.1.5 Module Interfaces Characteristics

**Table 3-6. Module Interfaces Characteristics [1]**

| Parameters | Condition | Range | Unit |
|---|---|---|---|
| UART maximum baud rate | | 115.2 | Kbps |
| ADC conversion time (latency) | (RES+2)/2+(GAIN !=0)<br>RES (Resolution) = 8 or 12 | 5-8 | $Clk_{ADC}$ cycles |
| ADC input resistance | Static load resistor of input signal | 4.0 | kΩ |
| ADC reference voltage ($V_{REF}$) | | 1.0 to $AV_{CC}$ – 0.6 | V |
| ADC input voltage | | 0 - $AV_{DD}$ | V |
| TWI maximum clock | | 400 | kHz |
| GPIO High level input voltage | $V_{CC}$ = 2.7-3.6V | 2 to $V_{CC}$+0.3 | V |
| GPIO Low level input voltage | $V_{CC}$ = 2.7-3.6V | -0.3 to 0.3 $V_{DD}$ | V |
| GPIO High level output voltage $V_{OH}$ | $V_{CC}$ = 3.0-3.6V | 2.4 to 0.94$V_{CC}$ | V |
| GPIO Low level output voltage $V_{OL}$ | $V_{CC}$ = 3.0-3.6V | 0.05$V_{CC}$ typ.<br>Max. 0.4 | V |
| Real-time oscillator frequency | | 32.768 | kHz |

Note 1: For detailed characteristics, refer to [1].

## 3.2 Physical/environmental Characteristics and Outline

**Table 3-7. Physical Characteristics**

| Parameters | Value | Comments |
|---|---|---|
| Size | 38.5 x 20.0mm | |
| Operating temperature range | -40°C to +85°C | -40°C to +85°C operational |

## 3.3 Pin Configuration

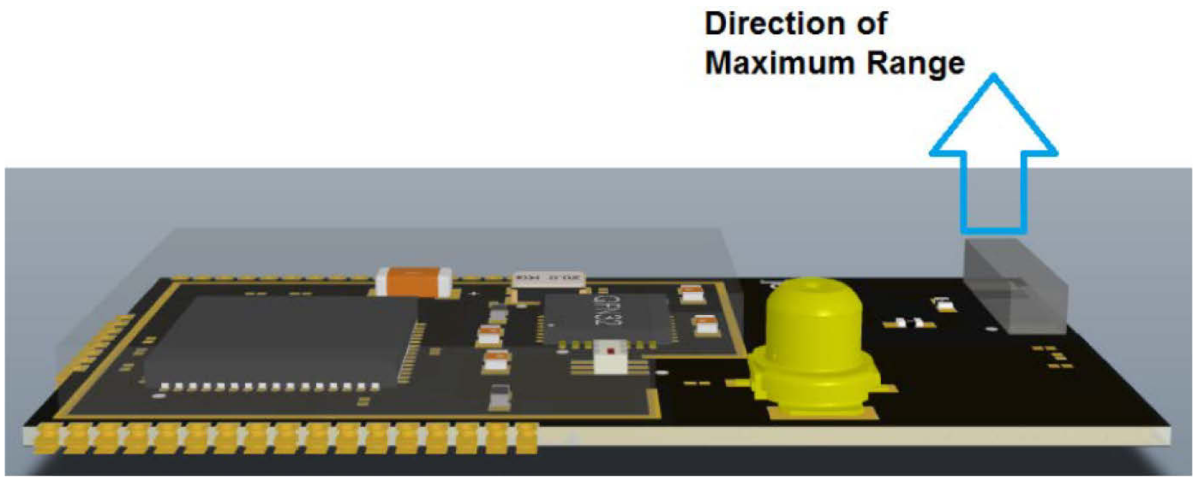
**Table 3-8. ATZB-X0-256-4-0-CN Pinout Description**

| Pin out | Pin descriptions | Function |
|---|---|---|
| 1 | AVSS | Analog Ground |
| 2 | AVSS | Analog Ground |
| 3 | DEVDD | Digital Power input pin |
| 4 | DEVDD | Digital Power input pin |
| 5 | RSET/PDI_CLOCK | RESET |
| 6 | PD4/SS | SPI |
| 7 | PD5/MOSI/XCK1 | SPI |
| 8 | PD6/MISO/RXD1/D- | SPI |
| 9 | PD7/SCK/TXD1/D+ | SPI |
| 10 | PA5 | GPIO / ADC / Analog COMP+ |
| 11 | PA4 | GPIO/ADC/Analog Comp- |
| 12 | DVSS | Digital Ground |
| 13 | PD2/SYNC/ASYNC/OC0C/ | UART |
| 14 | PD3/SYNC/TXD0/OC0D | UART |
| 15 | PD1/SCL/INT/OC0B | USART |
| 16 | PDI_DATA | PWM/TC |
| 17 | PA6 | GPIO/ADC |
| 18 | PA7 | GPIO/ADC |
| 19 | PB3 | GPIO/ADC/DAC1 |
| 20 | PB2 | GPIO/ADC/DAC/intwkup |
| 21 | PF1/OC0B/INT/XCK0 | INT/PWM/GPIO |
| 22 | PF2/OC0C/INT/RXD0 | INT/PWM/GPIO |
| 23 | PF3/OC0D/INT/TXD0 | INT/PWM/GPIO |
| 24 | PB0/IAREF/INT | ADC ref |
| 25 | PA0/ADC0/INT | ADC/ GPIO |
| 26 | PA1/ADC1/INT | ADC/ GPIO |
| 27 | PA2/ADC2/INT | ADC/ GPIO |
| 28 | PA3/ADC3/INT | ADC/ GPIO |
| 29 | DVSS | Digital Ground |
| 30 | PB6/TCK/INT | JTAG |
| 31 | PB4/TMS/INT | JTAG |
| 32 | PB7/TDO/INT | JTAG |
| 33 | PB5/TDI/INT | JTAG |
| 34 | PE3/TXD | GPIO/output counter |
| 35 | PE2/RXD | Wakeup INT |
| 36 | PE1/XCK | TWI/INT/GPIO |
| 37 | PE0 | TWI/INT/GPIO |
| 38 | PE5/OC1B/INT | GPIO/TC |
| 39 | PE4/SYNC/OC1A | Master Clock out put |

| Pin out | Pin descriptions | Function |
|---|---|---|
| 40 | PF0 | GPIO/Timer |
| 41 | DVSS | Digital Ground |
| 42 | DVSS | Digital Ground |

NOTE: TXD, RXD of UART are crossed inside ZigBit Module. External UART devices connecting to ZigBit Module should follow straight connection for UART.
UART_TXD_external_device <-> UART_TXD
UART_RXD_external_device <-> UART_RXD

## 3.4 Antenna Orientation Recommendation




The Antenna in this module is designed to provide the best possible LoS range in the direction indicated in this illustration.

## 3.5 Mounting Information

Figure 3-1 shows the PCB layout recommended for a ZigBit module. Neither via-holes nor wires are allowed on the PCB upper layer in the area occupied by the module. As a critical requirement, RF_GND pins should be grounded via several via-holes to be located right next to the pins thus minimizing inductance and preventing both mismatch and losses.

**Figure 3-1. ATZB-X0-256-4-0-CN Dimensions**

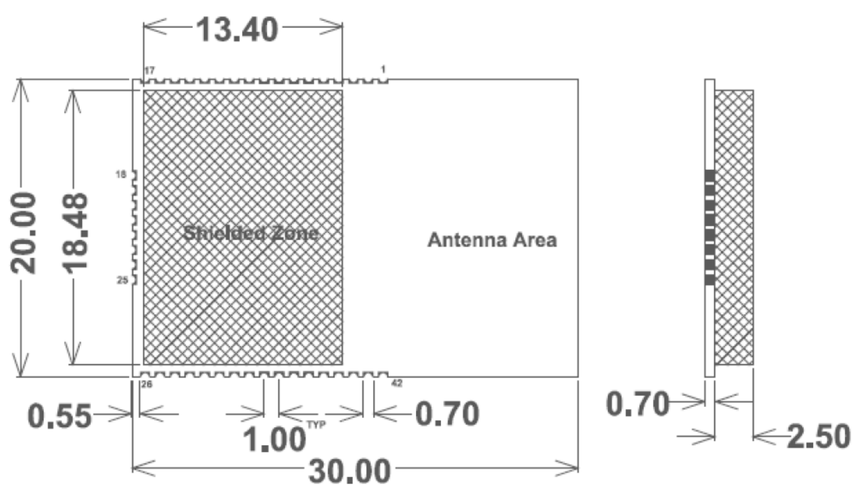


Figure 3-2. ATZB-X0-256-4-0-CN Pinout

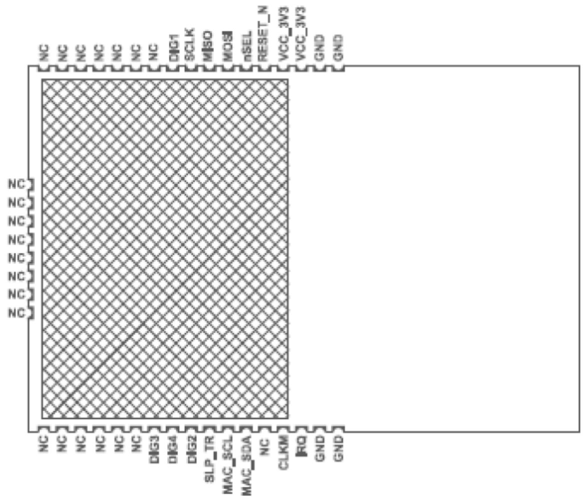



Figure 3-3. ATZB-X0-256-4-0-CN Foot Print Dimensions

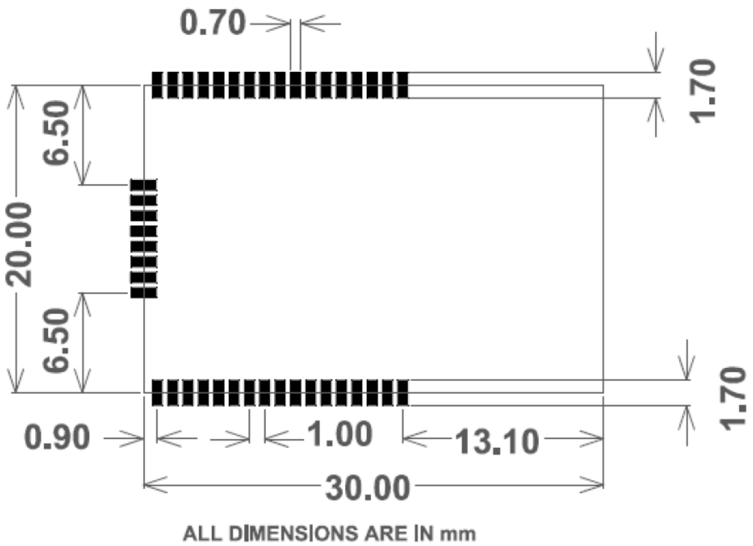


Figure 3-4. ATZB-X0-256-4-0-CN Mounting Information (preferred placement)

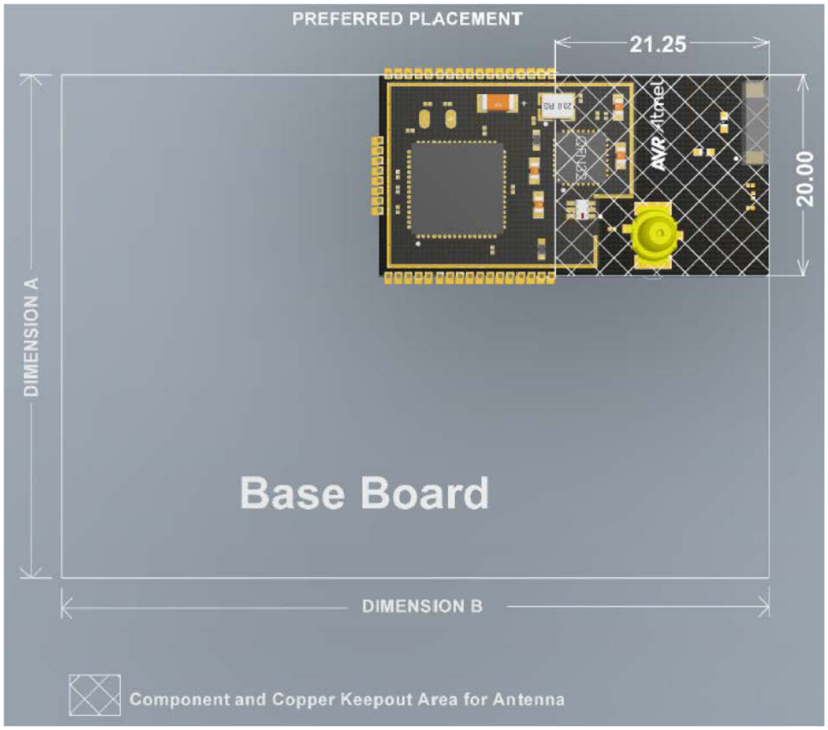
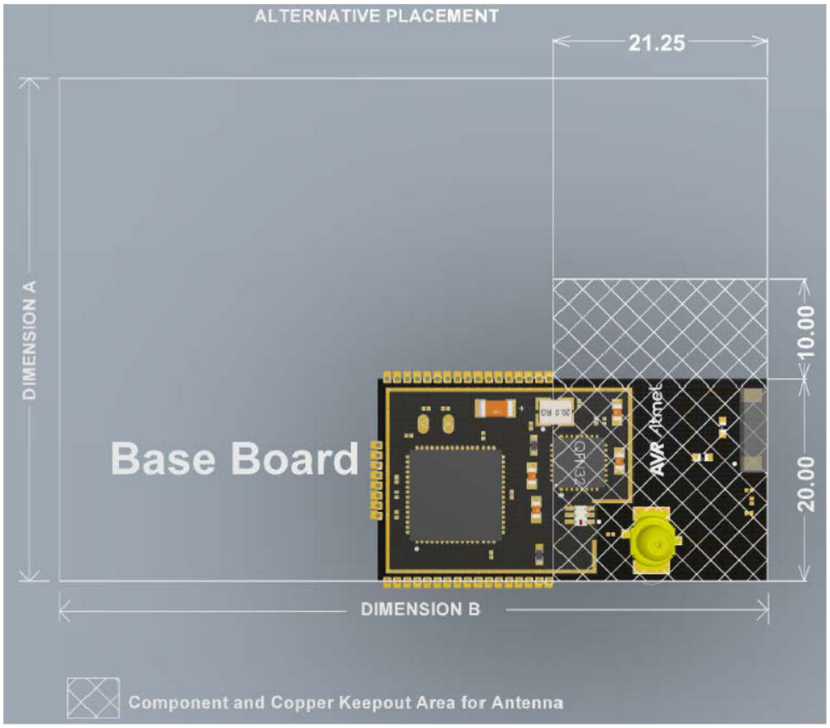



Figure 3-5. ATZB-X0-256-4-0-CN Mounting Information (alternative placement)




The ZigBit's location and orientation on the carrier board is illustrated in the above PCB Land pattern and Mounting information drawing. The Recommended placement of ZigBit on Carrier Board needs to be accurately followed to ensure performance on the end application.

## 3.6 Soldering Profile

The J-STD-020C-compliant soldering profile is recommended according to Table 3-9.

**Table 3-9. Soldering profile** [1]

| Profile feature | Green package |
|---|---|
| Average ramp-up rate (217°C to peak) | 3°C/s max. |
| Preheat temperature 175°C ±25°C | 180s max. |
| Temperature maintained above 217°C | 60s to 150s |
| Time within 5°C of actual peak temperature | 20s to 40s |
| Peak temperature range | 260°C |
| Ramp-down rate | 6°C/s max. |
| Time within 25°C to peak temperature | 8 minutes |

Note: 1. The package is backward compatible with PB/Sn soldering profile.

## 3.7 Antenna Reference Designs

Multiple factors affect proper antenna match, hence, affecting the antenna pattern. The particular factors are the board material and thickness, shields, the material used for enclosure, the board neighborhood, and other components adjacent to antenna. Following guidelines need to be followed when designing the base board for the ZigBit.

**General Recommendations:**

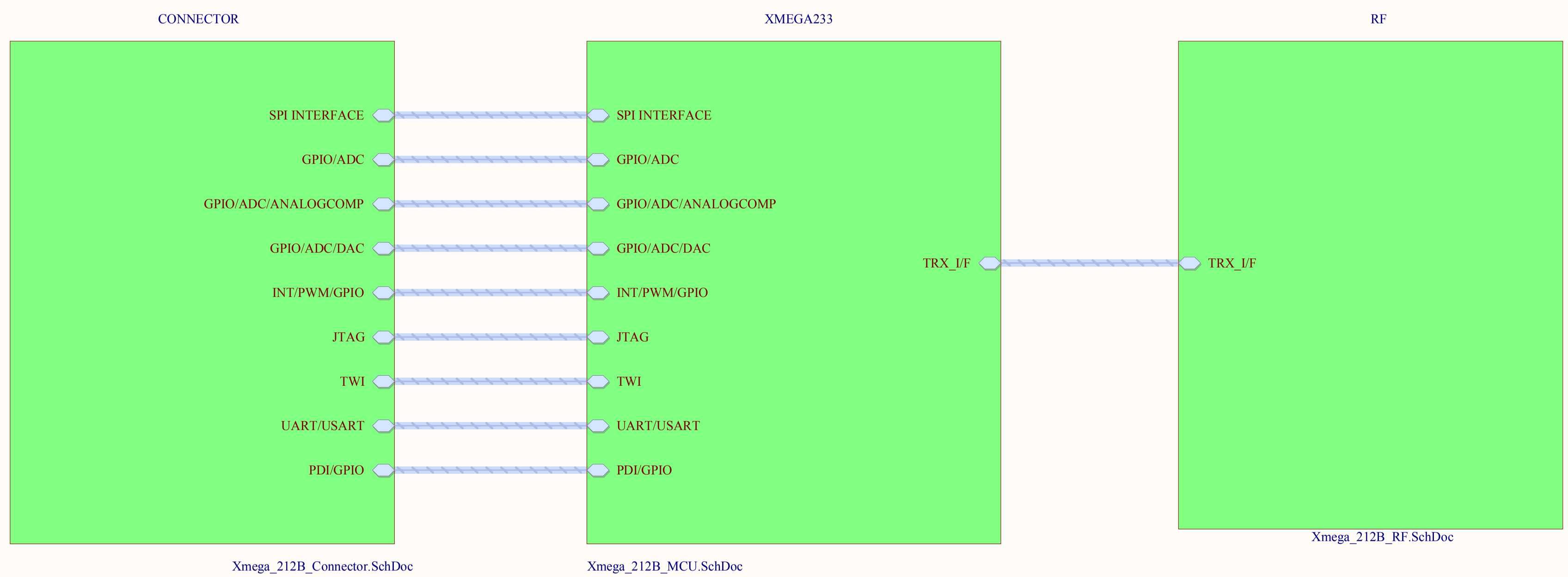
- Metal enclosure should not be used. Using low profile enclosure might also affect antenna tuning.
- Placing high profile components next to antenna should be avoided
- Having holes/vias punched around the periphery of the board eliminates parasitic radiation from the board edges also distorting antenna pattern
- ZigBit module should not be placed next to consumer electronics which might interfere with ZigBit's RF band frequency

The board design should prevent propagation of microwave field inside the board material. Electromagnetic waves of high frequency may penetrate the board thus making the edges of the board radiate, which may distort the antenna pattern. To eliminate this effect, metalized and grounded holes/vias must be placed around the board's edges.

# 4. Schematics

The following schematic drawings for the ATZB-X0-256-4-0-CN are in the following order:

- Top level schematics
- Connector schematics
- ATxmega256A3U schematics
- AT86RF212B schematics




PCB200

ZigBit Xmega Sub-GHz board PCB

LABEL1

Product number/revision
Serial number

Label ZigBit Shield

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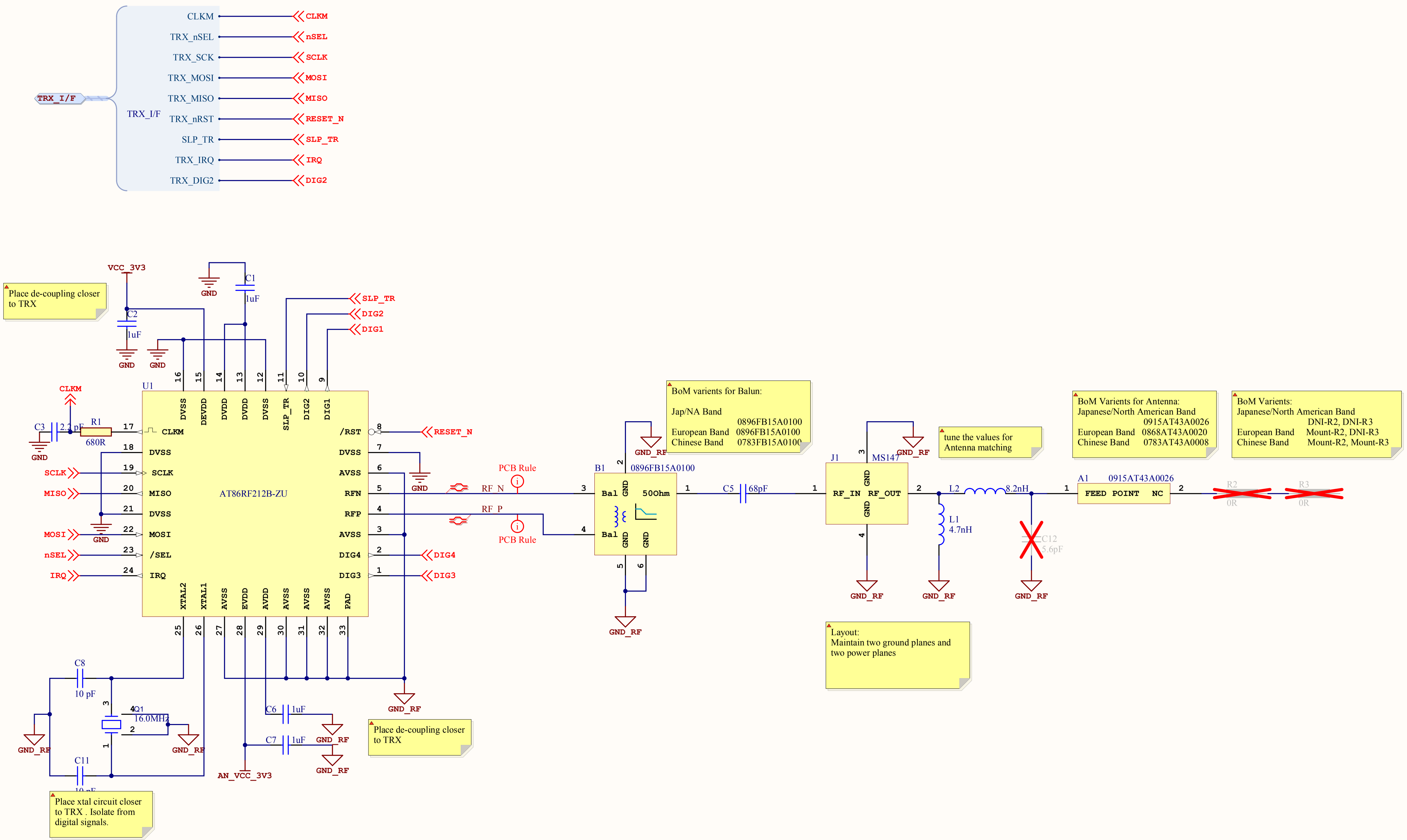


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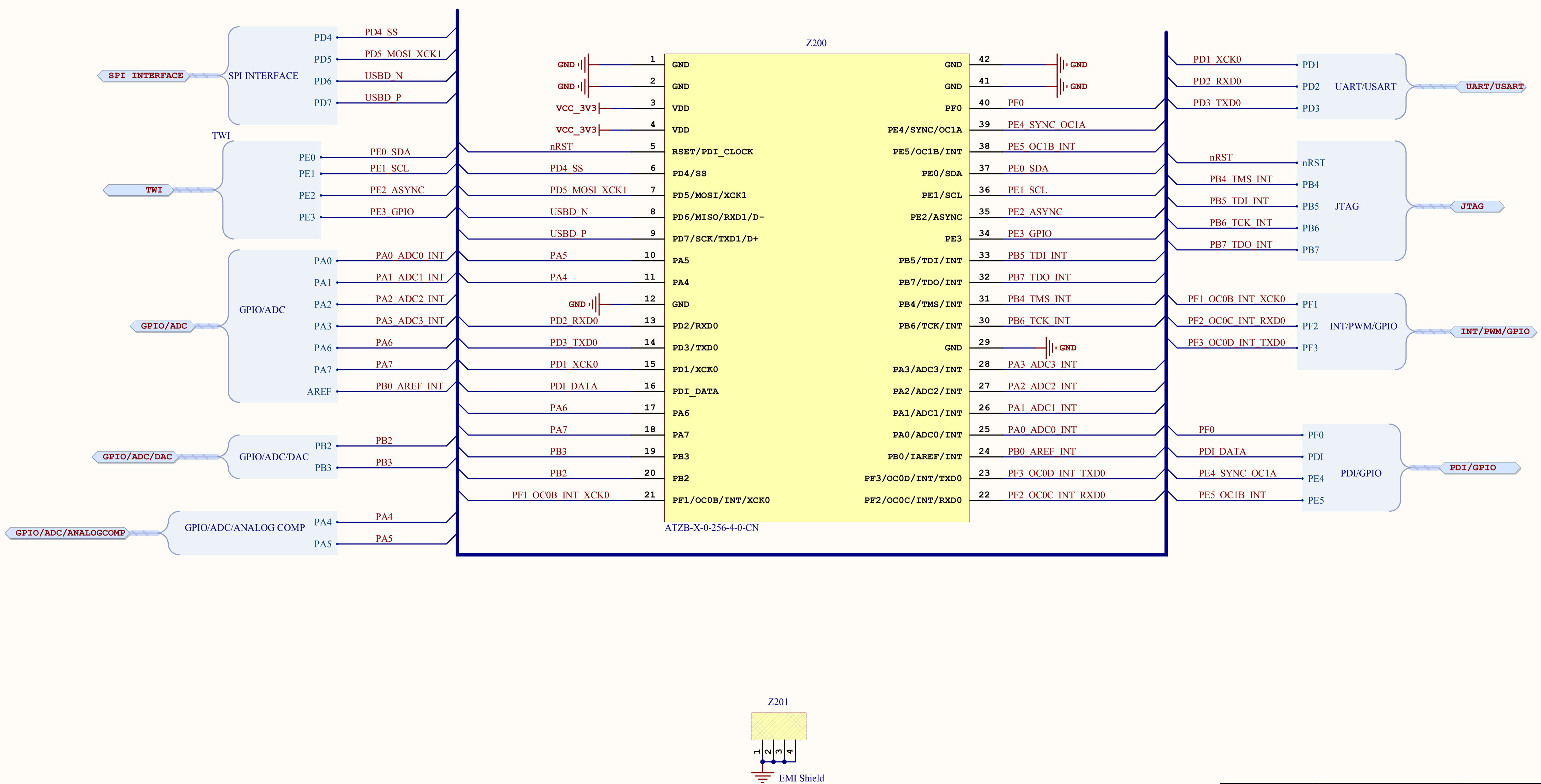


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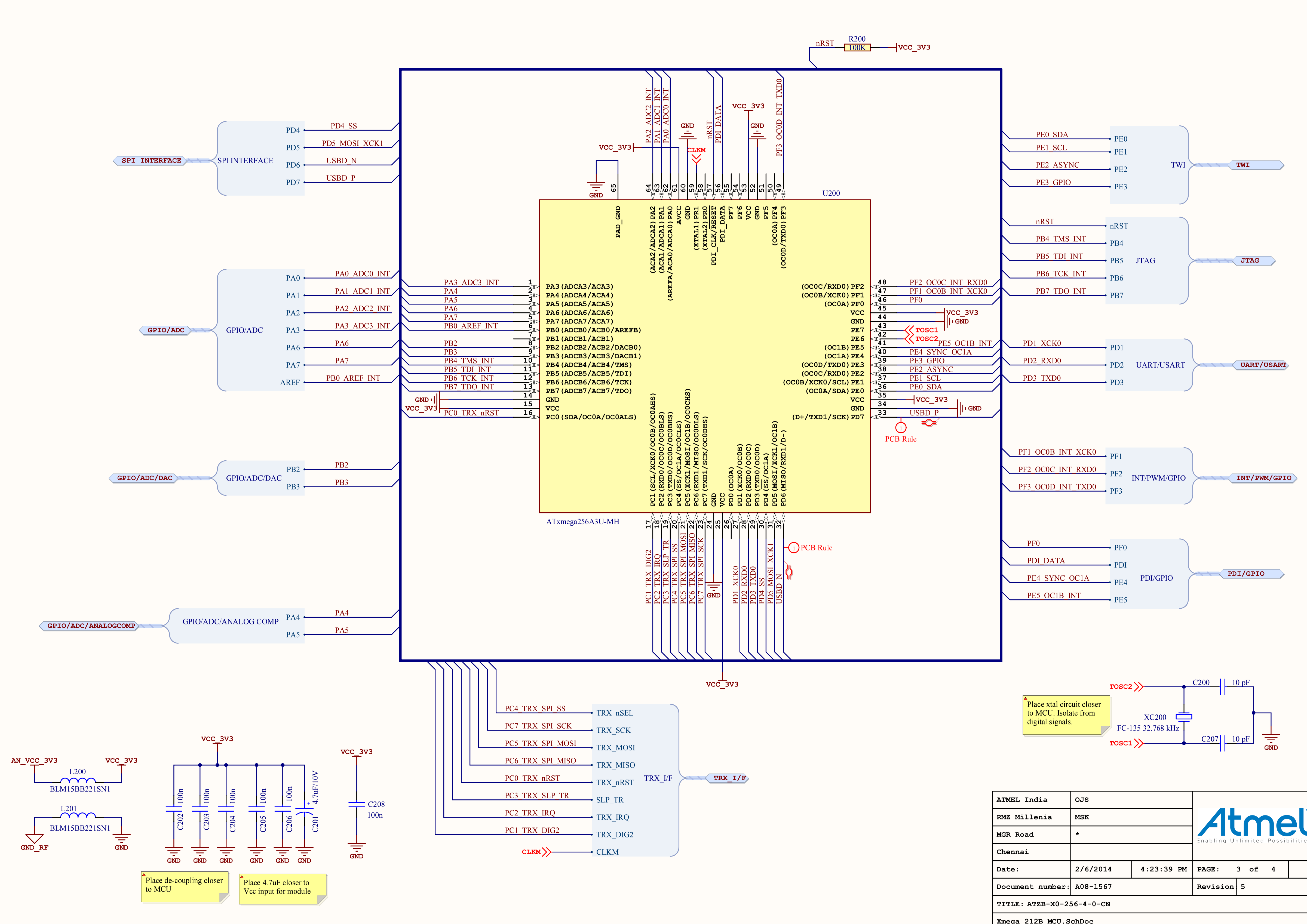


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## 4.1 Handling Instructions

The ZigBit Modules are fixed with an EMI Shield to ensure compliance to Emission and Immunity rules. This shield is galvanic and NOT air tight. So cleaning of the module with IPA / other similar agents is not advised. Humidity protection coating (conformal) will cause deviated RF behavior and coating material being trapped inside EMI Shield. So this should be avoided. For products requiring conformal coating, it is advised to suitably mask the ZigBit before applying the coating to rest of the ZigBit carrier board. To protect ZigBit from humidity, the housing of the product should ensure suitable Ingress Protection standards are complied with.

The MS-147 connector should never be exposed to Varnish / similar conformal coating material which will affect electrical connection on the surfaces of connector.

The in-built chip antenna has been tuned for the particular design.

## 4.2 General Recommendations

- Metal enclosure should not be used. Using low profile enclosure might also affect antenna tuning.
- Placing high profile components next to antenna should be avoided
- Having holes/vias punched around the periphery of the board eliminates parasitic radiation from the board edges also distorting antenna pattern
- ZigBit module should not be placed next to consumer electronics which might interfere with ZigBit's RF frequency band

# 5. Persistence Memory

A dedicated memory space is allocated to store product specific information and called the Persistence Memory. The organization of the persistence memory is as follows:

**Table 5-1. Persistence Memory**

| Data | Size |
|---|---|
| Structure Revision | 2 bytes |
| MAC address(1) | 8 bytes |
| Board information overall | 49 bytes |
| Board information – PCBA Name | 30 bytes |
| Board information – PCBA Serial number | 10 bytes |
| Board information – PCBA Atmel Part Number | 8 bytes |
| Board information – PCBA Revision | 1 byte |
| Reserved | 3 bytes |
| XTAL Calibration Value | 1 byte |
| Reserved | 7 bytes |
| Reserved | 4 bytes |
| CRC | 1 byte |

In ATZB-X0-256-4-0-CN, the persistence memory is stored in User Signature Row of ATxmega256A3U Microcontroller starting from address 0x0000. This section is not erased by chip erase and requires a dedicated erase command.

The user signature row is a separate memory section that is fully accessible (read and write) from application software and external programmers. See section "Read User Signature Row / Production Signature Row" under section "NVM Flash Commands" in XMEGA AU manual [1] for details in reading the user signature data from application software.

Note: 1. The MAC address stored inside the MCU is a uniquely assigned ID for each ZigBit and owned by Atmel. User of the ZigBit application can use this unique MAC ID to address the ZigBit in end-applications. The MAC ID can be read from the ZigBit using the Performance Analyzer Application that is supplied through Atmel Studio Gallery Extension.

# 6. Ordering Information

**Table 6-1. Ordering Information**

| Part number | Description |
|---|---|
| ATZB-X0-256-4-0-CN | 900 MHz IEEE802.15.4/ZigBee OEM module based on ATXMEGA256A3U MCU and AT86RF212B Transceiver with MS-147 test connector and chip antenna, Single unit |
| ATZB-X0-256-4-0-CNR | 900 MHz IEEE802.15.4/ZigBee OEM module based on ATXMEGA256A3U MCU and AT86RF212B Transceiver with MS-147 test connector and chip antenna, Tape & Reel |

Note: Tape & Reel quantity: 200.

# 7. Agency Certifications

## 7.1 United States (FCC)

This equipment complies with Part 15 of the FCC rules and regulations. To fulfill FCC Certification requirements, an OEM manufacturer must comply with the following regulations:

1. The ATZB-X0-256-4-0-CN modular transmitter must be 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 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:

> **IMPORTANT**: Contains FCC ID: VW4A091745. This equipment 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 (FCC 15.19).

The internal antenna used for this mobile transmitter must provide a separation distance of at least 20cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance. This device is approved as a mobile device with respect to RF exposure compliance, and may only be marketed to OEM installers. Use in portable exposure conditions (FCC 2.1093) requires separate equipment authorization.

> **IMPORTANT**: Modifications not expressly approved by this company could void the user's authority to operate this equipment (FCC section 15.21).

> **IMPORTANT**: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense (FCC section 15.105).

## 7.2 European Union (ETSI)

The ATZB-X0-256-3-0-C Module has been certified for use in European Union countries. If these modules are incorporated into a product, the manufacturer must ensure compliance of the final product to the European harmonized EMC and lowvoltage/safety standards. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive.

Furthermore, the manufacturer must maintain a copy of the modules' documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

**IMPORTANT**: The 'CE' marking must be affixed to a visible location on the OEM product. The CE mark shall consist of the initials "CE" taking the following form:

The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.

The CE marking must be affixed visibly, legibly, and indelibly.

More detailed information about CE marking requirements you can find at "DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" on 9 March 1999 at section 12.

## 7.3 Industry Canada (IC) Compliance Statements

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with radio frequency exposure limits set forth by Industry Canada for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the device and the user or bystanders.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par Industrie Canada pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre le dispositif et l'utilisateur ou des tiers.

CAUTION: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).
This Module is labelled with its own IC ID. If the IC ID Certification Number is not visible while installed inside another device, then the device should display the label on it referring the enclosed module. In that case, the final end product must be labelled in a visible area with the following:
“Contains Transmitter Module IC: 11019A-091745”
OR
“Contains IC: 11019A-091745”

Ce module est étiqueté avec son propre ID IC. Si le numéro de certification IC ID n'est pas visible lorsqu'il est installé à l'intérieur d'un autre appareil, l'appareil doit afficher l'étiquette sur le module de référence ci-joint. Dans ce cas, le produit final doit être étiqueté dans un endroit visible par le texte suivant:
“Contains Transmitter Module IC: 11019A-091745”
OR
“Contains IC: 11019A-091745”

## 8. Revision History

| Doc. Rev. | Date | Comments |
| --- | --- | --- |
| 42268A | 04/2014 | Initial document release |

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