

ZigBit™ 2.4 GHz Wireless Modules

ATZB-24-A2/B0

Datasheet







Table of Contents

Section 1

1.1	Summary.....	1-1
1.2	Applications.....	1-1
1.3	Key Features.....	1-2
1.4	Benefits.....	1-2
1.5	Abbreviations and Acronyms	1-2
1.6	Related Documents	1-4

Section 2

2.1	Overview	2-5
-----	----------------	-----

Section 3

3.1	Electrical Characteristics.....	3-7
3.1.1	Absolute Maximum Ratings	3-7
3.1.2	Test Conditions.....	3-7
3.1.3	RF Characteristics	3-8
3.1.4	ATmega1281V Microcontroller Characteristics	3-8
3.1.5	Module Interfaces characteristics	3-8
3.2	Physical/Environmental Characteristics and Outline	3-9
3.3	Pin Configuration	3-10
3.4	Mounting Information	3-14
3.5	Sample Antenna Reference Designs.....	3-15
3.5.1	General recommendations	3-16
3.6	Antenna specifications	3-17
3.6.1	ATZB-24-B0.....	3-17
3.6.2	ATZB-24-A2.....	3-19

Section 4

4.1	UNITED STATES (FCC).....	4-21
4.2	CANADA (IC).....	4-22
4.3	EUROPEAN UNION (ETSI).....	4-23
4.4	Approved Antenna List.....	4-23

Section 5

5.1	Ordering Information	5-24
-----	----------------------------	------



1.1 Summary

ZigBit™ is an ultra-compact, low-power, high-sensitivity 2.4 GHz IEEE 802.15.4/ZigBee® OEM module based on the innovative Atmel's mixed-signal hardware platform. It is designed for wireless sensing, control and data acquisition applications. ZigBit modules eliminate the need for costly and time-consuming RF development, and shortens time to market for a wide range of wireless applications.

Two different versions of 2.4 GHz ZigBit modules are available: ATZB-24-B0 module with balanced RF port for applications where the benefits of PCB or external antenna can be utilized and ATZB-24-A2 module with dual chip antenna satisfying the needs of applications requiring integrated, small-footprint antenna design.

1.2 Applications

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. Atmel offers two stack configurations: BitCloud and SerialNet. BitCloud is a ZigBee PRO certified software development platform supporting reliable, scalable, and secure wireless applications running on Atmel's ZigBit modules. SerialNet allows programming of the module via serial AT-command interface.

The applications include, but are not limited to:

- **Building automation & monitoring**
 - Lighting controls
 - Wireless smoke and CO detectors
 - Structural integrity monitoring
- HVAC monitoring & 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 Key Features

- Ultra compact size (24 x 13.5 x 2.0 mm for ATZB-24-A2 module and 18.8 x 13.5 x 2.0 mm for ATZB-24-B0 module)
- Innovative (patent-pending) balanced dual chip antenna design with antenna gain of approximately 0 dBi (for ATZB-24-A2 version)
- High RX sensitivity (-101 dBm)
- Outperforming link budget (104 dB)
- Up to 3 dBm output power
- Very low power consumption:
 - < 6 μ A in Sleep mode,
 - 19 mA in RX mode,
 - 18 mA in TX mode
- Ample memory resources (128K bytes of flash memory, 8K bytes RAM, 4K bytes EEPROM)
- Wide range of interfaces (both analog and digital):
 - 9 spare GPIO, 2 spare IRQ lines
 - 4 ADC lines + 1 line for supply voltage control (up to 9 lines with JTAG disabled)
 - UART with CTS/RTS control
 - USART
 - I²C
 - SPI
 - 1-Wire
 - Up to 30 lines configurable as GPIO
 - Capability to write own MAC address into the EEPROM
 - Optional antenna reference designs
 - IEEE 802.15.4 compliant transceiver
 - 2.4 GHz ISM band
 - BitCloud embedded software, including serial bootloader and AT command set

1.4 Benefits

- Small physical footprint and low profile for optimum fit in even the smallest of devices
- Best-in-class RF link range
- Extended battery life
- Easy prototyping with 2-layer PCB
- Ample memory for user software application
- Mesh networking capability
- Easy-to-use low cost Evaluation Kit
- Single source of support for HW and SW
- Worldwide license-free operation

1.5 Abbreviations and Acronyms

ADC	Analog-to -Digital Converter
API	Application Programming Interface
DC	Direct Current

DTR	Data Terminal Ready
DIP	Duap In-line package
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
GPIO	General Purpose Input/Output
HAL	Hardware Abstraction Layer
HVAC	Heating, Ventilating and Air Conditioning
HW	Hardware
I ² C	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 ZigBit module
NWK	Network layer
OEM	Original Equipment Manufacturer
OTA	Over-The-Air upgrade
PCB	Printed Circuit Board
PER	Package Error Ratio
PHY	Physical layer
RAM	Random Access Memory
RF	Radio Frequency
RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly
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
ZDK	ZigBit Development Kit
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

1.6 Related Documents

- [1] Atmel 8-bit AVR Microcontroller with 64K/128K/256K Bytes In-System Programmable Flash. 2549F AVR 04/06
- [2] Atmel Low-Power Transceiver for ZigBee Applications. AT86RF230 datasheet. doc5131.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] BitCloud™ IEEE 802.15.4/ZigBee Software. AVR2050: BitCloud User Guide. Atmels doc8199.pdf
- [6] ZigBit™ Development Kit. User's Guide. MeshNetics Doc. S-ZDK-451 - TBD

ZigBit™ Module Overview

2.1 Overview

ZigBit is a low-power, high-sensitivity IEEE 802.15.4/ ZigBee-compliant OEM module. This multi-functional device occupies less than a square inch of space, which is comparable to a typical size of a single chip. Based on a solid combination of Atmel's latest MCU Wireless hardware platform [1], the ZigBit offers superior radio performance, ultra-low power consumption, and exceptional ease of integration.

Figure 2-1. ATZB-24-B0 Block Diagram

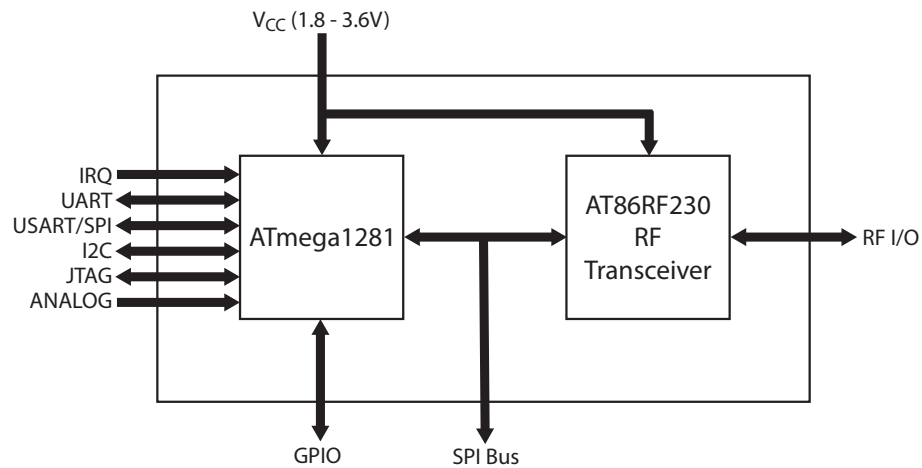
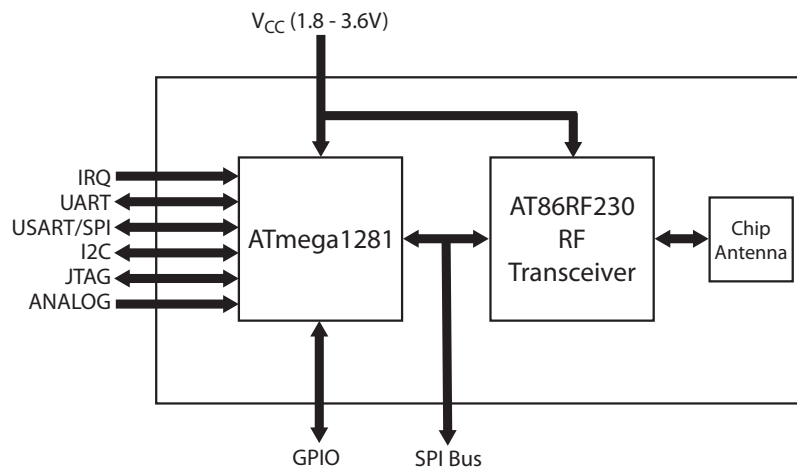


Figure 2-2. ATZB-24-A2 Block Diagram



ZigBit modules comply with the FCC (Part 15), IC and ETSI (CE) rules applicable to the devices radiating in uncontrolled environment. For details, see [“Agency Certifications” on page 4-21](#).

ZigBit fully satisfies the requirements of the “Directive 2002/95/EC of the European Parliament and the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment” (RoHS). Atmel provides fully compliant product in all regions where the directive is enforced since July 1, 2006.

ZigBit contains Atmel’s ATmega1281V Microcontroller [1] and AT86RF230 RF Transceiver [2]. The module features 128 Kbytes flash memory and 8 Kbytes RAM.

The ZigBit already contains a complete RF/MCU-related design with all the necessary passive components included. The module can be easily mounted on a simple 2-layer PCB. Compared to a custom RF/MCU design, a module-based solution offers considerable savings in development time and NRE cost per unit during the design, prototyping, and mass production phases of product development.

Innovative (patent-pending) dual chip antenna design in ATZB-24-A2 module eliminates the balun and achieves good performance over 2.4 GHz frequency band.

To jumpstart evaluation and development, Atmel also offers a complete set of evaluation and development tools. The ZigBit Development Kit [6] (ATZB-DK-24) comes with everything you need to create custom applications featuring ZigBit module.

The kit features MeshBean development boards with an easy-to-access extension connector for attaching third party sensors and other peripherals, and a JTAG connector for easy application uploading and debugging.

The kit also includes reference applications to speed up application development, source code for hardware interface layer and reference drivers for the all the module interfaces, intuitive development environment from Atmel, and comprehensive set of application notes and product documentation.

ZigBit modules comes bundled with BitCloud, a 2nd generation embedded software stack from Atmel. BitCloud is fully compliant with ZigBee PRO and ZigBee standards for wireless sensing and control [3], [4], [5] and it provides an augmented set of APIs which, while maintaining 100% compliance with the standard, offer extended functionality designed with developer’s convenience and ease-of-use in mind.

Depending on end-user design requirements, 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. In the former case, a user application may be used with the BitCloud software allowing customization of embedded applications through BitCloud’s C API.

In the latter case, the host processor controls data transmission and manages module peripherals via an extensive set of SerialNet AT commands. Thus, no firmware customization is required for a successful module design-in. Additionally, third-party sensors can be connected directly to the module, thus expanding the existing set of peripheral interfaces.





Section 3

Specifications

3.1 Electrical Characteristics

3.1.1 Absolute Maximum Ratings

Table 3-1. Absolute Maximum Ratings⁽¹⁾⁽²⁾

Parameters	Min	Max
Voltage on any pin, except RESET with respect to Ground	-0.5V	VCC + 0.5V
DC Current per I/O Pin		40 mA
DC Current DVCC and DGND pins		200 mA
Input RF Level		+10 dBm

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 Test Conditions

Table 3-2. Test conditions (unless otherwise stated), V_{CC} = 3V, T_{amb} = 25°C

Parameters	Range	Unit
Supply Voltage, V _{CC}	1.8 to 3.6	V
Current Consumption: RX mode	19	mA
Current Consumption: TX mode ⁽¹⁾	18	mA
Current Consumption: Radio is turned off, MCU is active 50% of the time ⁽¹⁾	14	mA
Current Consumption: Power-save mode ⁽¹⁾	6	µA

Note: 1. The parameters are measured under the following conditions:
a) BitCloud Software is running at 4 MHz clock rate, DTR line management is turned off
b) All interfaces are set to the default state (see Pin Assignment Table)
c) Output TX power is 0 dBm
d) JTAG is not connected

Current consumption actually depends on multiple factors, including but not limited to, the board design and materials, BitCloud 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

Parameters	Condition	Range	Unit
Frequency Band		2.4000 to 2.4835	GHz
Numbers of Channels		16	
Channel Spacing		5	MHz
Transmitter Output Power	Adjusted in 16 steps	-17 to +3	dBm
Receiver Sensitivity	PER = 1%		
On-Air Data Rate		250	kbps
TX Output/ RX Input Nominal Impedance	For balanced output	100	Ω

3.1.4 ATmega1281V Microcontroller Characteristics

Table 3-4. ATmega1281V Characteristics

Parameters	Condition	Range	Unit
On-chip Flash Memory size		128K	bytes
On-chip RAM size		8K	bytes
On-chip EEPROM size		4K	bytes
Operation Frequency		4	MHz

3.1.5 Module Interfaces characteristics

Table 3-5. Module Interfaces characteristics

Parameters	Condition	Range	Unit
UART Maximum Baud Rate		38.4	kbps
ADC Resolution/ Conversion Time	In single conversion mode	10/200	Bits/ μ s
ADC Input Resistance		>1	M Ω
ADC Reference Voltage (VREF)		1.0 to $V_{CC} - 3$	V
ADC Input Voltage		0 - VREF	V
I ² C Maximum Clock		222	kHz
GPIO Output Voltage (High/Low)	-10/ 5 mA	2.3/ 0.5	V
Real Time Oscillator Frequency		32.768	kHz

3.2 Physical/Environmental Characteristics and Outline

Parameters	Value	Comments
Size	18.8 x 13.5 x 2.0 mm	ATZB-24-B0
	24.0 x 13.5 x 2.0 mm	ATZB-24-A2
Weight	1.3g	ATZB-24-B0
	1.5g	ATZB-24-A2
Operating Temperature Range	-20°C to +70°C	-40°C to +85°C operational ⁽¹⁾
Operating Relative Humidity Range	no more than 80%	

Note: 1. Minor degradation of clock stability may occur.

Figure 3-1. ATZB-24-B0 Mechanical drawing

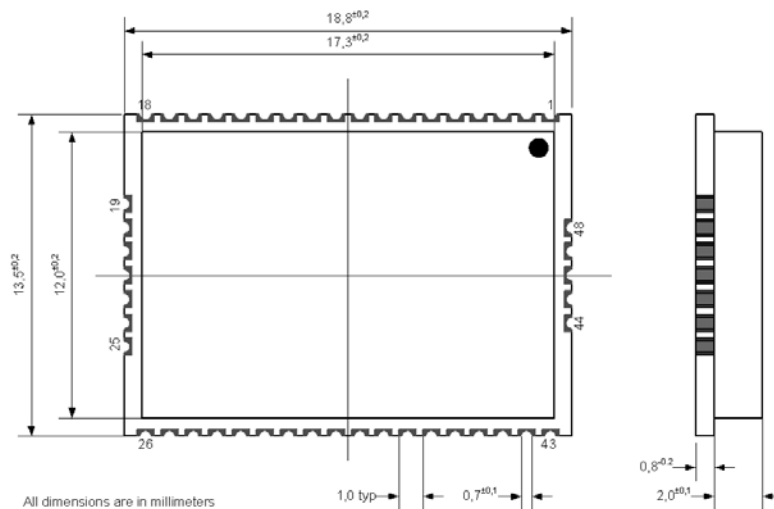
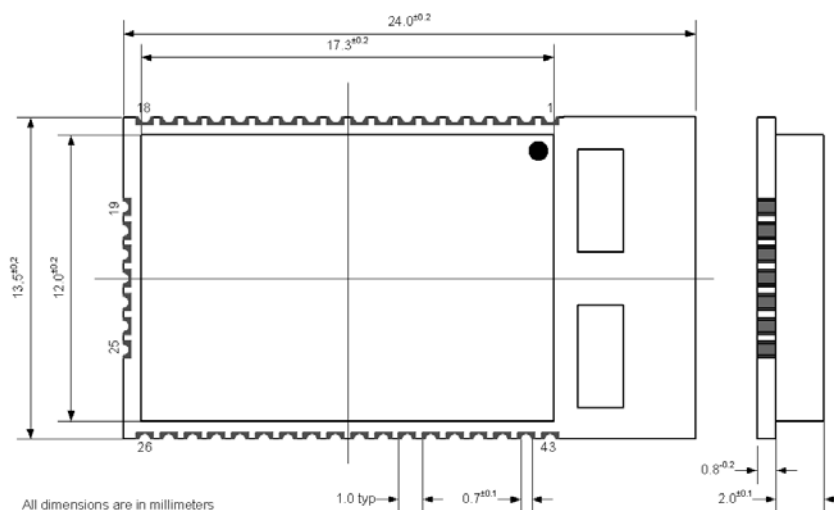


Figure 3-2. ATZB-24-A2 Mechanical drawing



3.3 Pin Configuration

Figure 3-3. ATZB-24-B0 Pinout

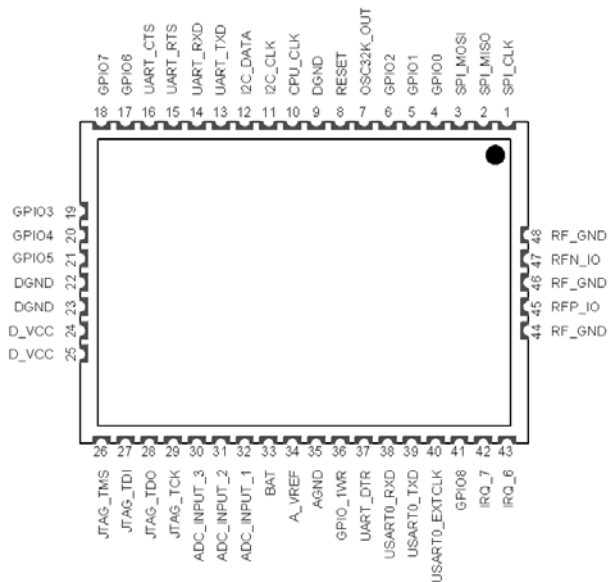


Figure 3-4. ATZB-24-A2 Pinout

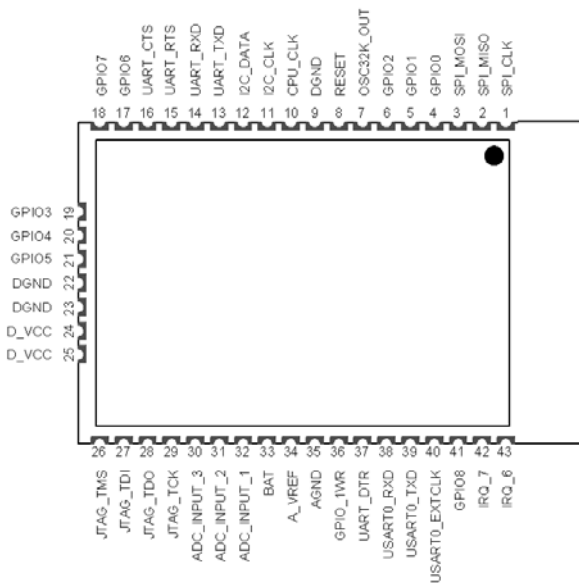


Table 3-6. Pin descriptions

Connector Pin	Pin Name	Description	I/O	Default State after Power on
1	SPI_CLK	Reserved for stack operation ⁽⁴⁾	O	
2	SPI_MISO	Reserved for stack operation ⁽⁴⁾	I/O	
3	SPI_MOSI	Reserved for stack operation ⁽⁴⁾	I/O	
4	GPIO0	General Purpose digital Input/Output 0 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
5	GPIO1	General Purpose digital Input/Output 1 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
6	GPIO2	General Purpose digital Input/Output 2 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
7	OSC32K_OUT	32.768 kHz clock output ⁽⁴⁾⁽⁵⁾	O	
8	RESET	Reset input (active low) ⁽⁴⁾		
9,22,23	DGND	Digital Ground		
10	CPU_CLK	RF clock output. When module is in active state, 4 MHz signal is present on this line. While module is in the sleeping state, clock generation is also stopped ⁽⁴⁾ .	O	
11	I2C_CLK	I ² C Serial clock output ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	O	tri-state
12	I2C_DATA	I ² C Serial data input/output ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
13	UART_TXD	UART receive input ⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
14	UART_RXD	UART transmit output ⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	O	tri-state
15	UART_RTS	RTS input (Request to send) for UART hardware flow control. Active low ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
16	UART_CTS	CTS output (Clear to send) for UART hardware flow control. Active low ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾⁽⁸⁾	O	tri-state
17	GPIO6	General Purpose digital Input/Output 6 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
18	GPIO7	General Purpose digital Input/Output 7 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
19	GPIO3	General Purpose digital Input/Output 3 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
20	GPIO4	General Purpose digital Input/Output 4 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
21	GPIO5	General Purpose digital Input/Output 5 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	tri-state
24,25	D_VCC	Digital Supply Voltage (V _{CC}) ⁽⁹⁾		
26	JTAG_TMS	JTAG Test Mode Select ⁽²⁾⁽³⁾⁽⁴⁾⁽⁶⁾	I	
27	JTAG_TDI	JTAG Test Data Input ⁽²⁾⁽³⁾⁽⁴⁾⁽⁶⁾	I	
28	JTAG_TDO	JTAG Test Data Output ⁽²⁾⁽³⁾⁽⁴⁾⁽⁶⁾	O	
29	JTAG_TCK	JTAG Test Clock ⁽²⁾⁽³⁾⁽⁴⁾⁽⁶⁾	I	
30	ADC_INPUT_3	ADC Input Channel 3 ⁽²⁾⁽³⁾⁽⁷⁾	I	tri-state
31	ADC_INPUT_2	ADC Input Channel 2 ⁽²⁾⁽³⁾⁽⁷⁾	I	tri-state
32	ADC_INPUT_1	ADC Input Channel 1 ⁽²⁾⁽³⁾⁽⁷⁾	I	tri-state
33	BAT	ADC Input Channel 0, used for battery level measurement. This pin equals V _{CC} /3. ⁽²⁾⁽³⁾⁽⁷⁾	I	tri-state
34	A_VREF	Input/Output reference voltage for ADC	I/O	tri-state

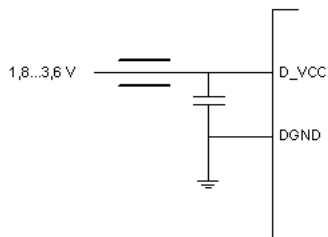


Table 3-6. Pin descriptions

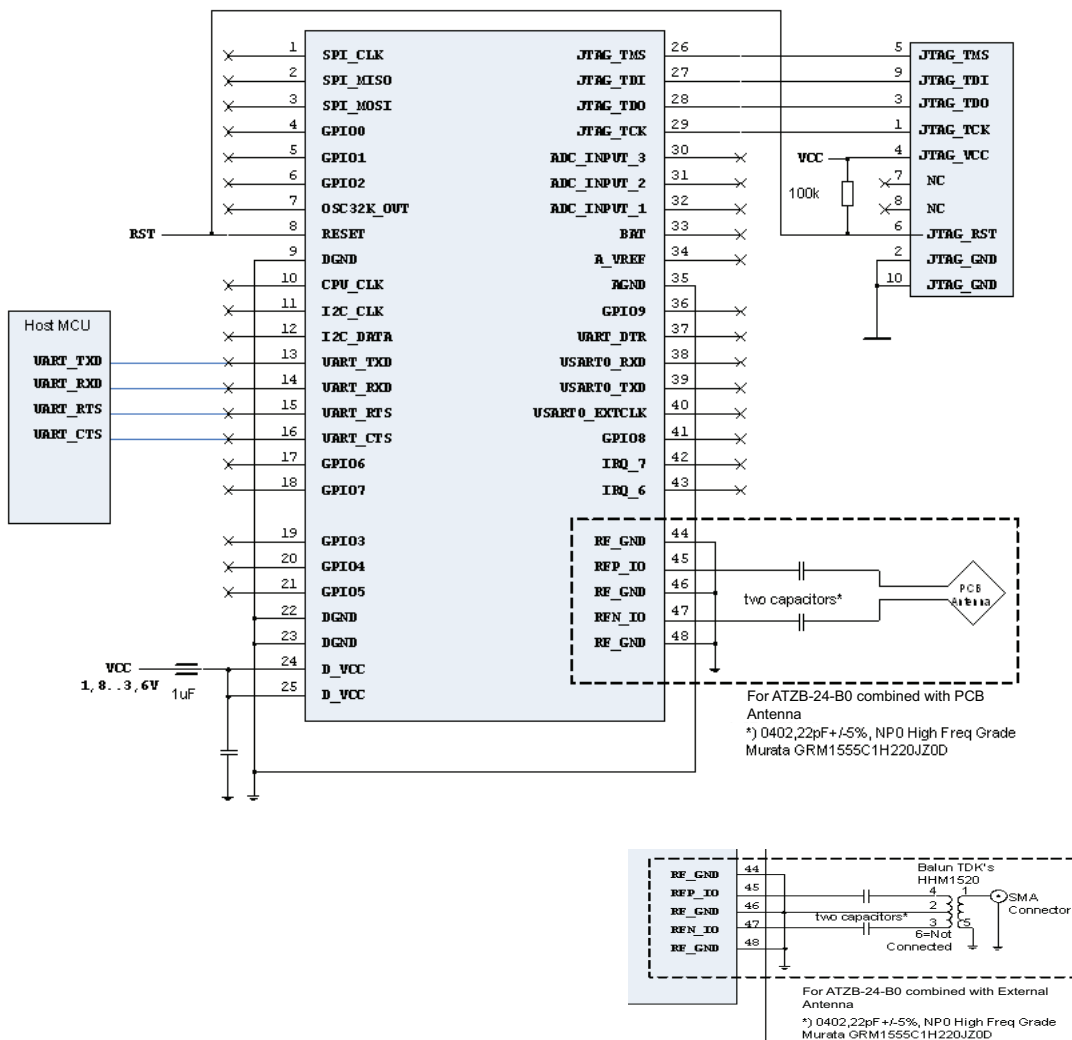
Connector Pin	Pin Name	Description	I/O	Default State after Power on
35	AGND	Analog ground		
36	GPIO_1WR	1-wire interface ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I/O	
37	UART_DTR	DTR input (Data Terminal Ready) for UART. Active low ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
38	USART0_RXD	USART/SPI Receive pin ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
39	USART0_TXD	USART /SPI Transmit pin ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	O	tri-state
40	USART0_EXTCLK	USART/SPI External Clock ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾⁽¹¹⁾	I/O	tri-state
41	GPIO8	General Purpose Digital Input/Output	I/O	tri-state
42	IRQ_7	Digital Input Interrupt request 7 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
43	IRQ_6	Digital Input Interrupt request 6 ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾	I	tri-state
44,46,48	RF GND	RF Analog Ground ⁽²⁾⁽³⁾⁽⁴⁾⁽⁷⁾		
45	RFP_IO	Differential RF Input/Output ⁽¹⁰⁾	I/O	
47	RFN_IO	Differential RF Input/Output ⁽¹⁰⁾	I/O	

- Notes:
1. The UART_TXD pin is intended for input (i.e. its designation as "TXD" implies some complex system containing ZigBit as its RF terminal unit), while UART_RXD pin, vice versa, is for output.
 2. Most of pins can be configured for general purpose I/O or for some alternate functions as described in details in the ATmega1281V Datasheet [1].
 3. GPIO pins can be programmed either for output, or for input with/without pull-up resistors. Output pin drivers are strong enough to drive LED displays directly (refer to figures on pages 387-388, [1]).
 4. All digital pins are provided with protection diodes to D_VCC and DGND
 5. It is strongly recommended to avoid assigning an alternate function for OSC32K_OUT pin because it is used by BitCloud. However, this signal can be used if another peripheral or host processor requires 32.768 kHz clock, otherwise this pin can be disconnected.
 6. Normally, JTAG_TMS, JTAG_TDI, JTAG_TDO, JTAG_TCK pins are used for on-chip debugging and flash burning. They can be used for A/D conversion if JTAGEN fuse is disabled.
 7. The following pins can be configured with the BitCloud software to be general-purpose I/O lines: GPIO0, GPIO1, GPIO2, GPIO3, GPIO4, GPIO5, GPIO6, GPIO7, GPIO8, GPIO_1WR, I2C_CLK, I2C_DATA, UART_TXD, UART_RXD, UART_RTS, UART_CTS, ADC_INPUT_3, ADC_INPUT_2, ADC_INPUT_1, BAT, UART_DTR, USART0_RXD, USART0_TXD, USART0_EXTCLK, IRQ_7, IRQ_6. Additionally, four JTAG lines can be programmed with software as GPIO as well, but this requires changing the fuse bits and will disable JTAG debugging.
 8. With BitCloud, CTS pin can be configured to indicate sleep/active condition of the module thus providing mechanism for power management of host processor. If this function is necessary, connection of this pin to external pull-down resistor is recommended to prevent the undesirable transients during module reset process.

9. Using ferrite bead and 1 μ F capacitor located closely to the power supply pin is recommended, as shown below.



10. Pins 44 through 48 are not designed for the ATZB-24-A2 module. Note these pins are used in ATZB-24-B0, see them in antenna schematics below.



11. In SPI mode, USART0_EXTCLK is output. In USART mode, this pin can be configured as either input or output pin.

3.4 Mounting Information

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

Figure 3-5. ATZB-24-B0 PCB Recommended Layout, Top View

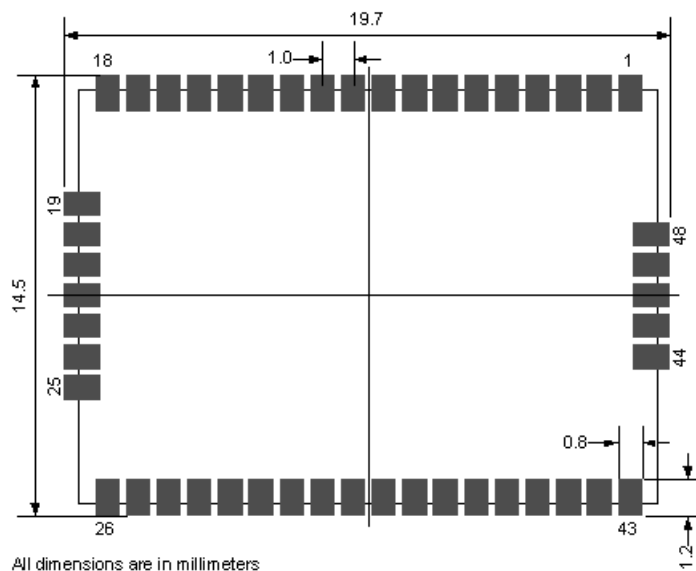
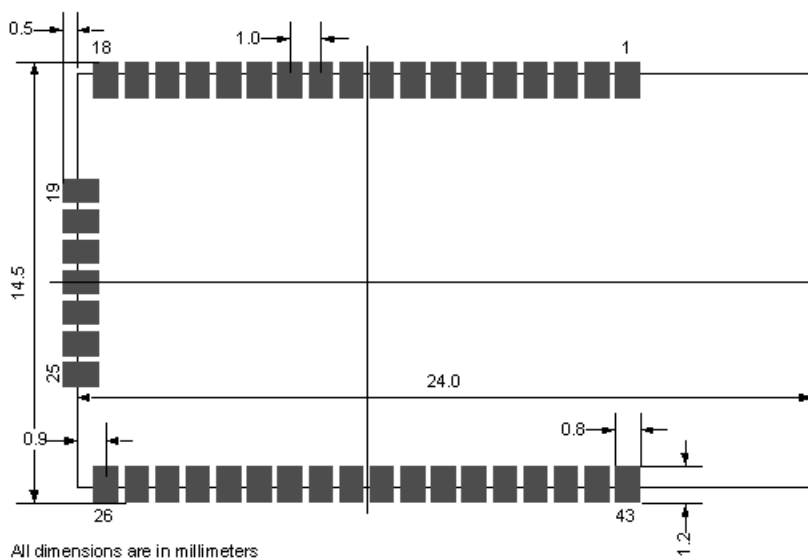


Figure 3-6. ATZB-24-A2 PCB Recommended Layout, Top View



match, hence, affecting the 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.

3.5.1 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 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.

3.6 Antenna specifications

3.6.1 ATZB-24-B0

Figure 3-8. Symmetric Dipole Antenna Pattern (horizontal and vertical plane) for ATZB-24-B0

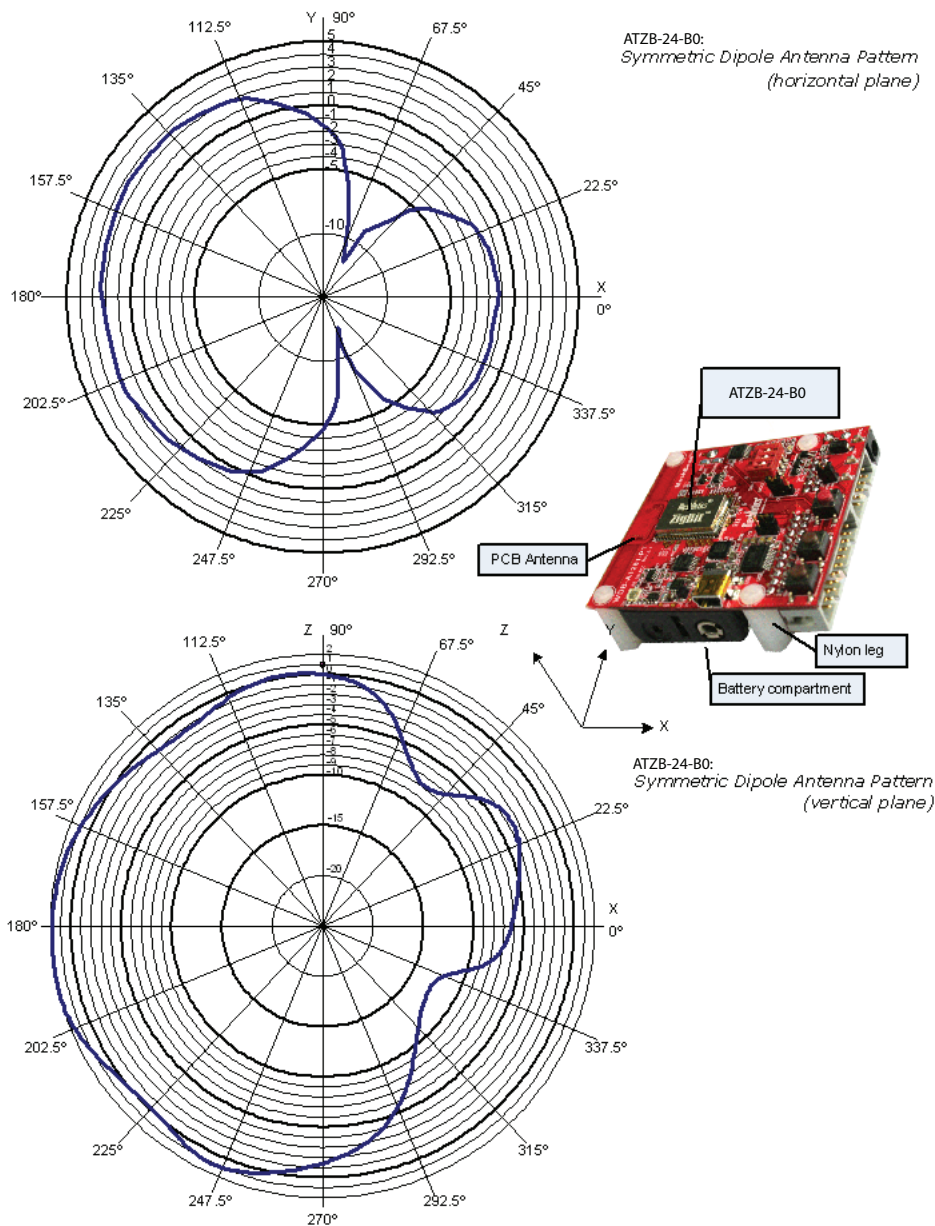
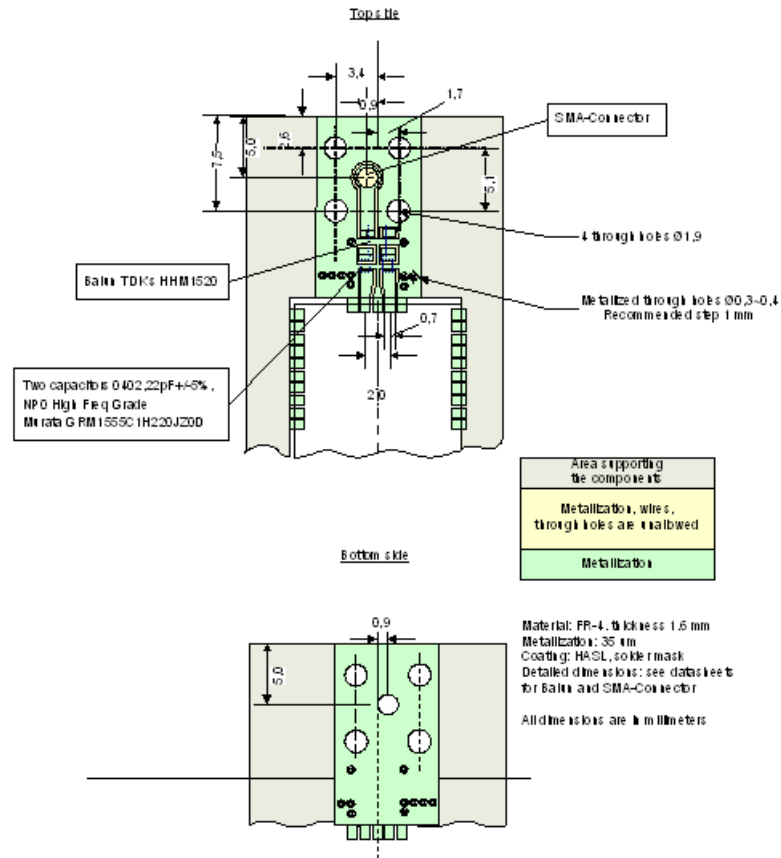
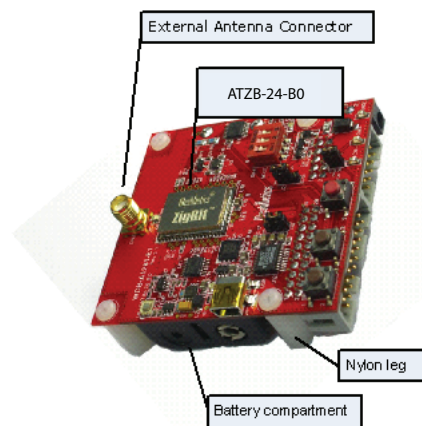


Figure 3-9. PCB Layout with 50 Ohm External Antenna recommended for ATZB-24-B0



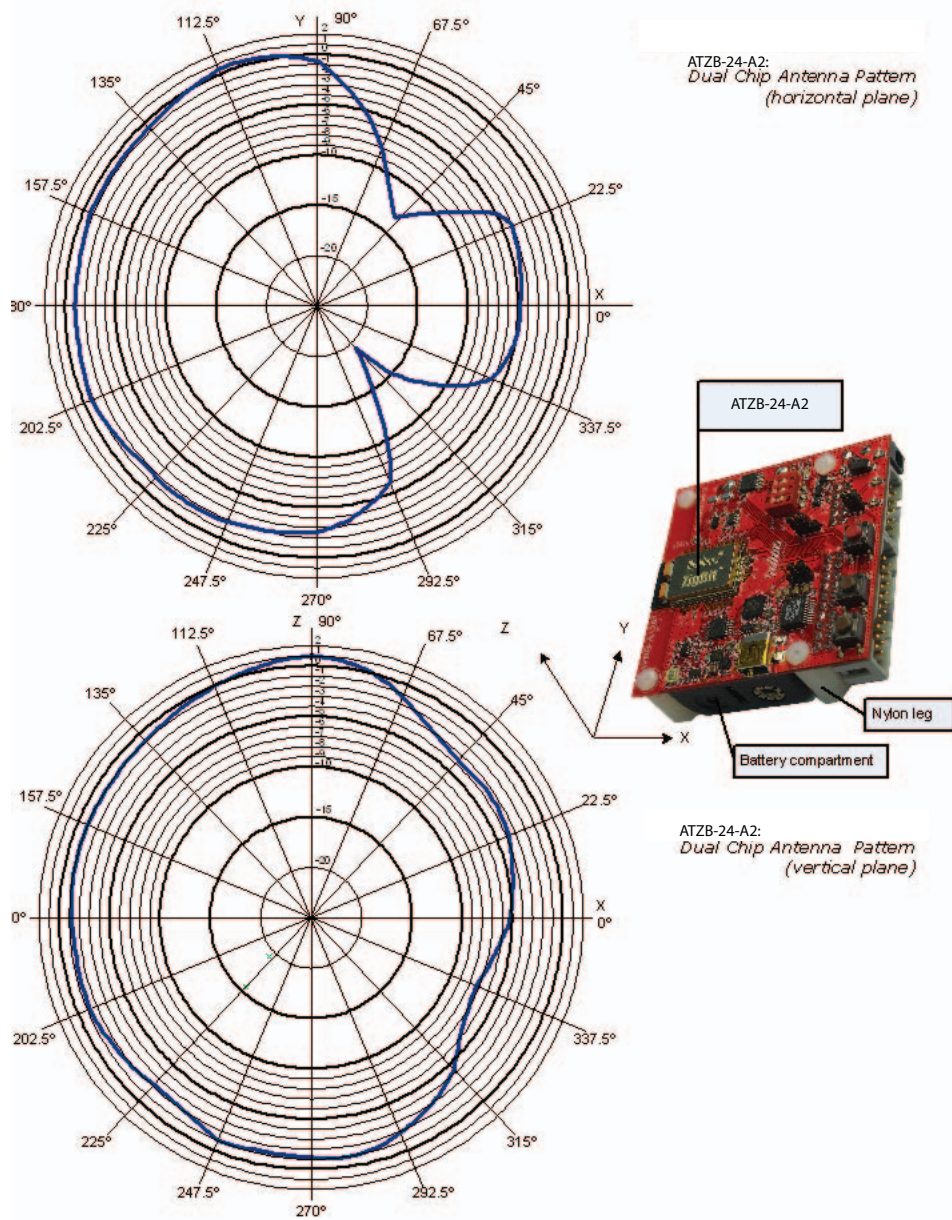
In case the external unbalanced 50 Ohm antenna is required, it can be easily interfaced to ATZB-24-B0 module by using 2:1 balun as shown above. The reference design in [Figure 3-10](#) demonstrates how to use SMA connector.

Figure 3-10. SMA connectors



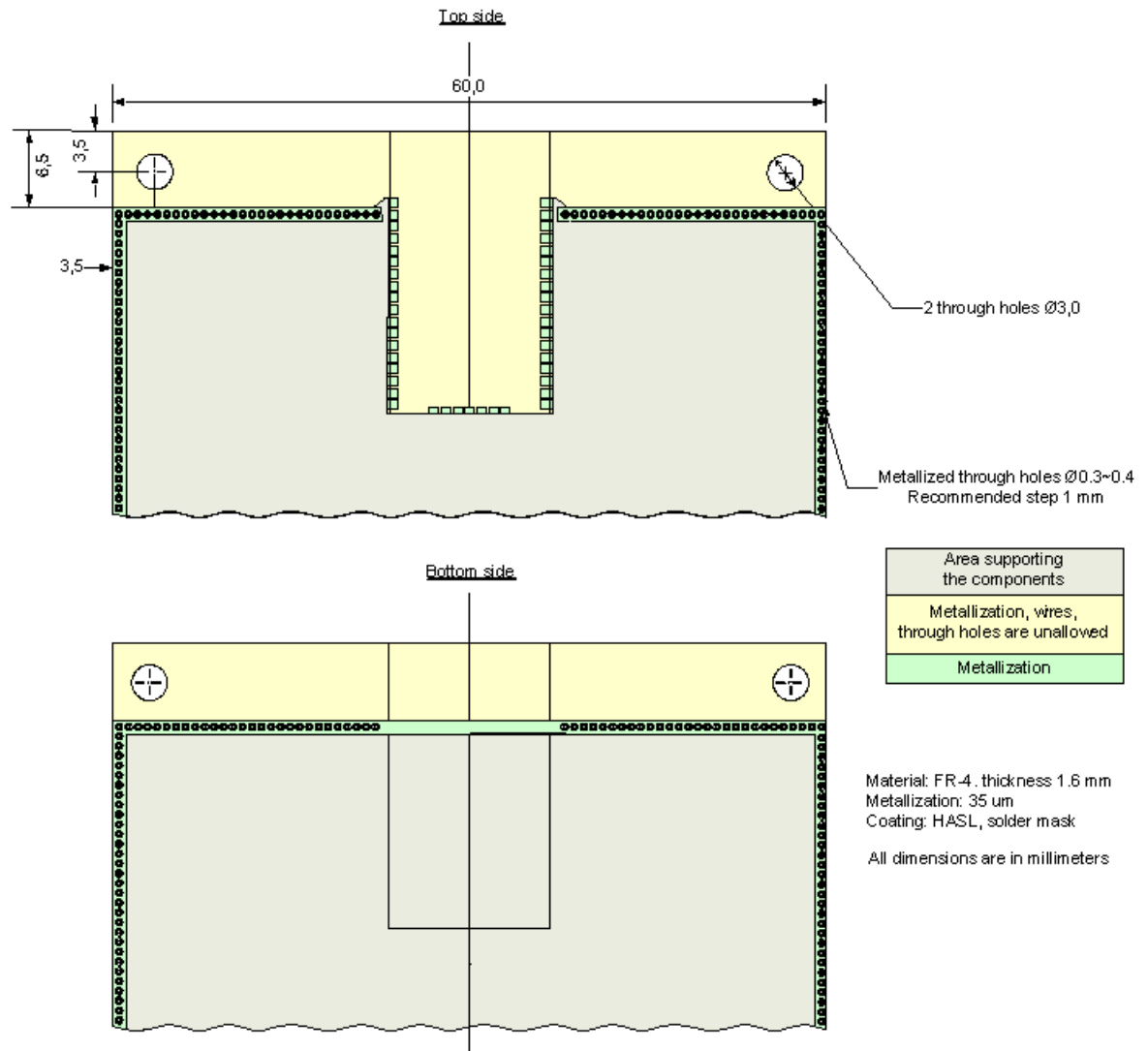
3.6.2 ATZB-24-A2

Figure 3-11. Symmetric Dipole Antenna Pattern (horizontal and vertical plane) for ATZB-24-A2



Note: The antenna patterns presented above were observed using PCB enhanced with legs made of original nylon.

Figure 3-12. PCB Layout with Dual Chip Antenna Module recommended for ATZB-24-A2



Normally, chip antennas are more tolerant of the board or enclosure materials in ZigBit's neighborhood as well. However, general recommendations given above for the PCB antenna design still apply.

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, metallized and grounded holes must be placed around the board's edges as shown.

Since the design of dual chip antenna is intended for installation on FR-4 board 1.6 mm thick, the antenna performance may only be guaranteed for the particular board type and thickness.



Agency Certifications

4.1 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 modular transmitter must be labelled 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:

Example of label required for OEM product containing ATZB-24-A2 module

Contains FCC ID: U6TZIGBIT-A2
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Example of label required for OEM product containing ATZB-24-B0 module

Contains FCC ID: U6TZIGBIT-B0
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Any similar wording that expresses the same meaning may be used.

2. To be used with the ATZB-24-B0 module, the external antennas have been tested and approved which are specified in here below. The ATZB-24-B0 Module may be integrated with other custom design antennas which OEM installer must authorize following the FCC 15.21 requirements.

WARNING: The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment.

IMPORTANT: 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 / external antenna(s) used for this mobile transmitter must provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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).

4.2 CANADA (IC)

Equipment is subject to certification under the applicable RSSs, shall be permanently labelled on each item, or as an inseparable combination. The label must contain the following information for full compliance:

For ATZB-24-A2 module:

Certification Number:	IC: 7036A-ZIGBITA2
Manufacturer's Name, Trade Name or Brand Name:	ZIGBIT
Model Name:	ATZB-24-A2

For ATZB-24-B0 module:

Certification Number:	IC: 7036A-ZIGBITB0
Manufacturer's Name, Trade Name or Brand Name:	ZIGBIT
Model Name:	ATZB-24-B0

IMPORTANT: This equipment for which a certificate has been issued is not considered certified if it is not properly labelled. The information on the Canadian label can be combined with the manufacturer's other labelling requirements

IMPORTANT: 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.

IMPORTANT: To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

IMPORTANT: 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.

4.3 EUROPEAN UNION (ETSI)

The ATZB-24-A2 and ATZB-24-B0 Modules has been certified for use in European Union countries.

If the ATZB-24-A2 and ATZB-24-B0 Modules are incorporated into a product, the manufacturer must ensure compliance of the final product to the European harmonized EMC and low-voltage/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 ATZB-24-A2 and ATZB-24-B0 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:

- If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
- 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.

Certification Approved Antennas list is presented in below.

4.4 Approved Antenna List

ATZB-24-A2 Module works with integrated dual chip antenna. The design of the antenna is fully compliant with all the aforementioned regulation.

ATZB-24-B0 Module has been tested and approved for use with the antennas listed in the table below. ATZB-24-0B Module may be integrated with other custom design antennas which OEM installer must authorize with respective regulatory agencies.

Table 4-1. Approved Antenna specifications

Part Number	Manufacture and description	Gain [dBi]	Minimum separation [cm]
2010B48-01	Antenova Titanis, swivel antenna (1/4 wave antenna) with SMA connector, frequency range 2.4 - 2.5 GHz	2.2	20
17010.10	WiMo, swivel antenna (1/2 wave antenna) with SMA connector, frequency range 2.35 - 2.5 GHz	2.1	20



Section 5

Ordering Information

5.1 Ordering Information

Part Number	Description
ATZB-24-B0R	2.4 GHz IEEE802.15.4/ZigBee OEM Module w/ Balanced RF Port
ATZB-24-A2R	2.4 GHz IEEE802.15.4/ZigBee OEM Module with dual chip antenna

Note: Tape&Reel quantity: 200



Headquarters

Atmel Corporation
2325 Orchard Parkway
San Jose, CA 95131
USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

International

Atmel Asia
Unit 1-5 & 16, 19/F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon
Hong Kong
Tel: (852) 2245-6100
Fax: (852) 2722-1369

Atmel Europe
Le Krebs
8, Rue Jean-Pierre Timbaud
BP 309
78054 Saint-Quentin-en-
Yvelines Cedex
France
Tel: (33) 1-30-60-70-00
Fax: (33) 1-30-60-71-11

Atmel Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Product Contact

Web Site
www.atmel.com

Technical Support
avr@atmel.com

Sales Contact
www.atmel.com/contacts

Literature Requests
www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© 2009 Atmel Corporation. All rights reserved. Atmel®, Atmel logo and combinations thereof, and others are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.