Atmel®

Atmel IEEE 802.15.4 Solutions

Proprietary ISM, ZigBee RF4CE and ZigBee PRO

Atmel RF Single-chip Solution

Atmel delivers the industry's most advanced RF single-chip solutions. These IEEE 802.15.4-compliant devices combine either an ARM® Cortex®-M0+ based- or industry's leading AVR, microcontroller with a best-in-class 2.4GHz RF transceiver.

The combination of low current consumption in all operating modes, a degradation-free supply voltage range down to 1.8V and the fastest wake-up time from SLEEP mode to active modes makes the Atmel single-chip solution the most power-efficient devices in the market. Various power-down modes enable further power optimizations, such as keeping the RF transceiver active while the microcontroller sleeps. For more details on the Atmel RF single-chip solution, visit www.atmel.com/wireless/singlechip.

Boost Your Overall System Performance

The radio interface of the Atmel single-chip solution offers a unique hardware feature that boosts the overall system performance to support a great variety of IEEE 802.15.4-compliant applications. Radio link reliability is additionally improved when using the antenna diversity feature, which automatically selects the better of two antennas for each incoming frame. The device supports the control of external power amplifiers for range extension. High data rate modes up to 2Mbit/s are available for addressing general-purpose 2.4GHz industrial, scientific and medical (ISM) applications.

The single-chip, low-power design enables designers to implement a new generation of battery-driven systems, save board space and bring down the overall system bill of material (BoM). Free software stacks from Atmel libraries and hardware evaluation and development kits support systems development.

Atmel QTouch® Library support makes it easy to combine capacitive touch functionality with RF in a single chip. For more details on QTouch Library, visit www.atmel.com/products/touchsolutions/touchsoftware/default.aspx.

Transceivers

Efficient wireless applications require high-performance and low-power components. Atmel transceivers deliver the leading RF link budget with the industry's lowest power consumption. Atmel offers the most feature-rich IEEE 802.15.4-compliant transceiver family for the regional 700/800/900MHz and the worldwide 2.4GHz frequency bands that address wireless applications.

Using hardware features like antenna diversity or external power amplifier support, you can boost the already outstanding transceiver performance even further to increase the network reliability and RF range of your system. Beside IEEE 802.15.4-compliant applications, the transceiver family offers on-air data rates up to 2Mbit/s for general-purpose ISM applications. Pin compatibility ensures an easy transition between devices or frequency bands.

Free software suites, as well as various hardware evaluation and development kits and modules, enable rapid system development and prototyping.

700/800/900MHz Transceivers

The Atmel AT86RF212B is a low-power, low-voltage RF transceiver for the regional 700/800/900MHz frequency bands available in China, Europe, Japan, and North America. This transceiver offers an extreme 120dB link budget (-110dBm receiver sensitivity/+10dBm transmit power) designed for low-cost IEEE 802.15.4, ZigBee,® and high data rate ISM applications.

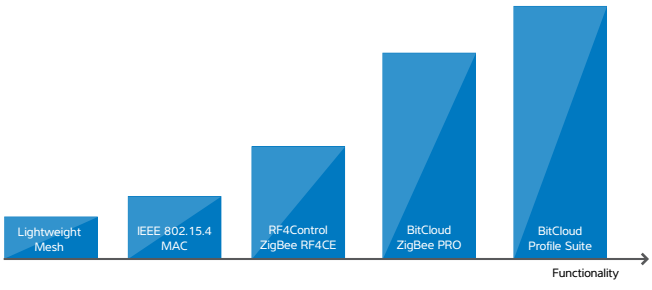
2.4GHz Transceivers

The Atmel AT86RF23x family of transceivers is designed to operate in the 2.4GHz ISM band available worldwide. The transceivers offer link budgets up to 105dB (-101dBm receiver sensitivity/+4dBm transmit power). For a complete overview of features, key parameters and targeted application areas, please visit: www.atmel.com/products/microcontrollers/wireless/default.aspx.

Proprietary Lightweight Mesh Software Stack

Atmel Lightweight Mesh software stack is an easy-to-use proprietary low-power wireless mesh network protocol. It has been designed to address the needs of a wide range of wireless connectivity applications. Some of these applications include:

- Remote control
- Alarms and security
- Lighting control
- Automatic meter reading (AMR)
- Home and commercial building automation
- Toys and educational equipment



The Lightweight Mesh software stack is designed to work with all Atmel IEEE 802.15.4 transceivers and SoCs. Currently the stack works with Atmel AVR® microcontrollers (MCUs), but given its extreme portability and low resource requirements, it can be run on almost any Atmel MCU. For more details, visit www.atmel.com/tools/LIGHTWEIGHT_MESH.aspx.

IEEE 802.15.4 Compliant Software

ZigBee® Member

Atmel offers a suite of free and certified IEEE802.15.4-compliant software stacks, including:

- IEEE 802.15.4 MAC
- ZigBee RF4CE
- ZigBee PRO

In addition to software stacks, Atmel offers ready-to-use reference implementations for ZigBee Smart Energy (ZSE), ZigBee Building Automation (ZBA), ZigBee Home Automation (ZHA) and ZigBee Remote Control (ZRC). As a result, choosing Atmel gives you a head start by delivering ready-to-use wireless solutions and the shortest time to market.

IEEE 802.15.4 MAC

The IEEE 802.15.4 standard defines the protocol and compatible interconnection for data communication devices using low data rate, low power and low complexity, short-range radio frequency (RF) transmissions in a wireless personal area network (WPAN). Atmel developed the MAC stack software for different target platforms (microcontroller and board) and RF transceivers based on a new architecture. This allows easy portability across various Atmel platforms and transceivers, and configurability to improve resource usage. For more details, visit www.atmel.com/tools/ieee802_15_4mac.aspx.

Atmel RF4Control - ZigBee RF4CE

The Atmel RF4Control is a ZigBee RF4CE-compliant embedded platform for the Atmel RF single-chip solution — the Atmel ATmega128RFA1. This provides a global standard for advanced and easy-to-use RF remotes that deliver non-line-of-sight operation, two-way communication, longer range of use and extended battery life.

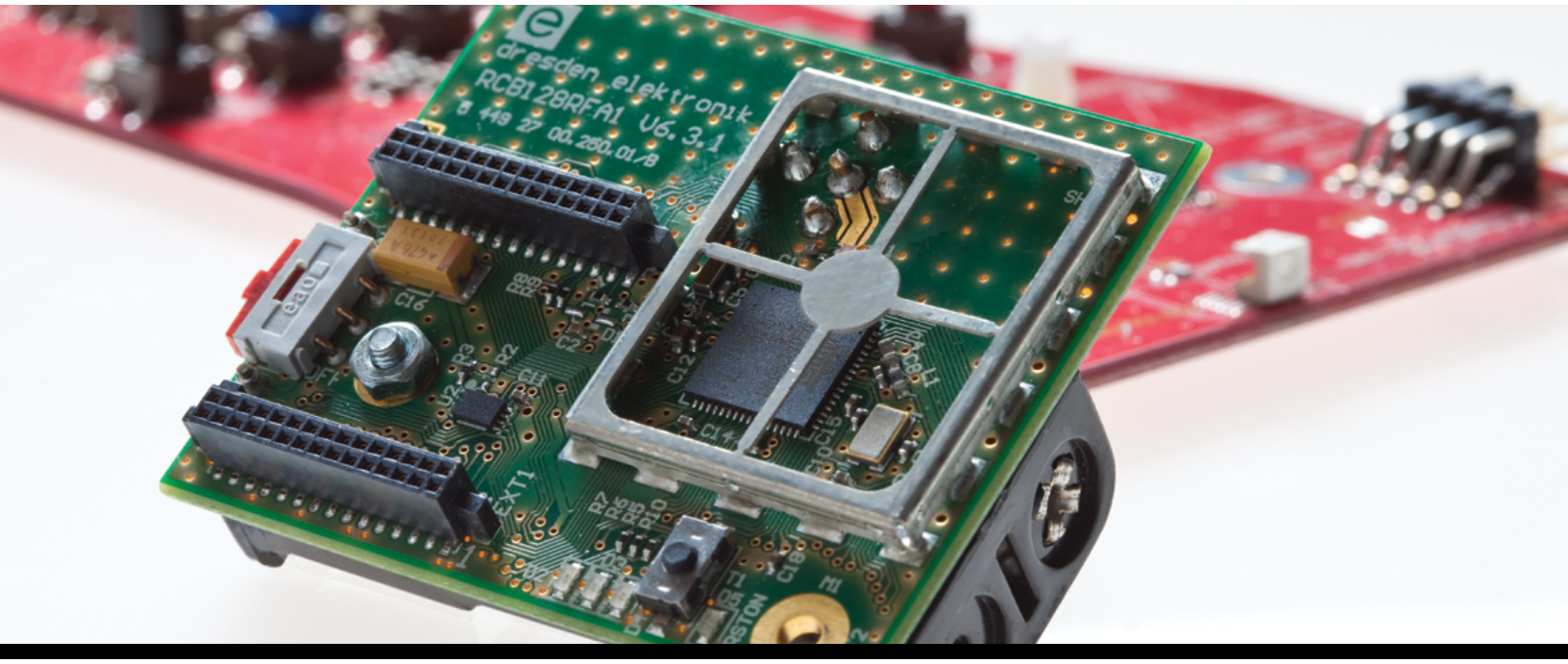
Atmel also offers a ready-to-use reference implementation for the ZigBee Remote Control profile exclusively designed for the ZigBee RF4CE specifications. The ZigBee Remote Control simplifies how consumers control and use various types of CE devices within home theatre experience, media center control and in-system remote control programming. For more details, visit www.atmel.com/RF4CE.

Atmel BitCloud - ZigBee PRO

The Atmel BitCloud® is a full-featured, second-generation embedded ZigBee PRO compliant platform for the Atmel megaAVR® and ARM® processor-based microcontrollers. The stack provides a software development platform for reliable, scalable and secure wireless applications running on Atmel wireless platforms. For more details, visit www.atmel.com/BitCloud.

Atmel BitCloud Profile Suite

The Atmel BitCloud Profile Suite is a ready-to-use framework for rapid development of ZigBee certified products, based on the IEEE 802.15.4 compliant BitCloud ZigBee PRO stack from Atmel. The suite includes a complete set of fully functional reference implementations of ZigBee Smart Energy (ZSE), ZigBee Building Automation (ZBA), ZigBee Home Automation (ZHA), and ZigBee Light Link (ZLL) device types. For information and downloads, visit www.atmel.com/tools/BITCLOUDPROFILESUITE-ZIGBEEPROPUBLICPROFILE.aspx.



ZigBee Home Automation (ZHA) ZigBee Home Automation is the global standard for the control of appliances, lighting, environment, energy management, safety and security. It supports a diverse ecosystem of service providers, original device manufacturers (ODM) and original equipment manufacturers (OEM) with a standards-based wireless solution for home and small office automation.

ZigBee Smart Energy (ZSE) ZigBee Smart Energy offers utilities and energy service providers secure, easy-to-use wireless home area networks (HAN) for managing energy. Smart energy gives these groups and their customers the power to directly communicate with thermostats and other smart appliances.

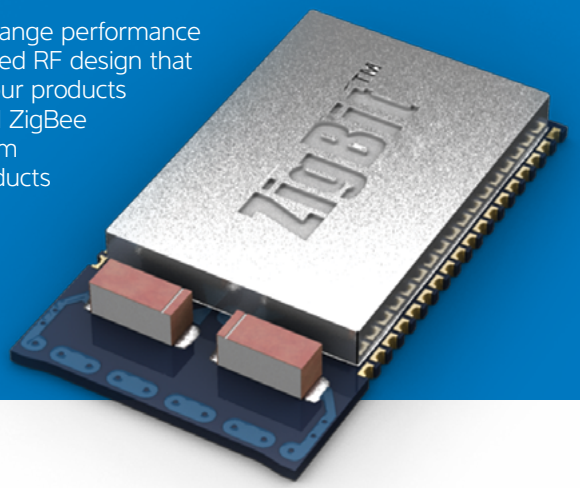
ZigBee Light Link (ZLL) ZigBee Light Link provides a global standard for interoperable and very easy-to-use consumer lighting and control products, allowing consumers to gain wireless control over all their LED fixtures, light bulbs, timers, remotes and switches. This standard lets consumers change lighting remotely to reflect ambiance, task or season, all while managing energy use and making their homes greener.

Products built using this standard are as easy-to-use as a common dimmer switch. The standard does not require any special devices to coordinate with lighting network, making it both easy and intuitive for consumers to use every day. Plus, the standard makes adding or even removing products to the lighting network a snap. ZigBee Light Link products earning the ZigBee Certified seal will be the industry's only networked consumer lighting products offering simplicity and interoperability.

Atmel ZigBit Wireless Modules

Atmel ZigBit® is a compact 802.15.4/ZigBee module featuring record-breaking range performance and exceptional ease of integration. It also packs a complete FCC/CE/ARIB-certified RF design that eliminates costly and time-consuming RF development and helps you deliver your products to market on time and on budget. Combine that with bundled IEEE802.15.4 and ZigBee PRO-certified software, and it's no wonder ZigBits are used worldwide by system integrators and OEMs to add standards-based wireless connectivity to their products for energy efficiency, building automation, automated meter reading and more.

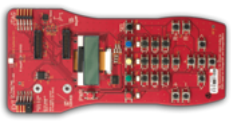
For details on Atmel ZigBit Modules, visit www.atmel.com/ZigBit.



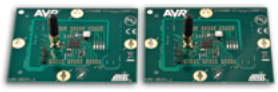
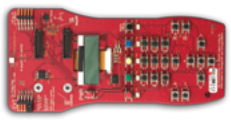
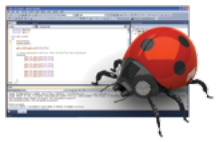
Atmel IEEE 802.15.4 Devices

Product	Flash (KBytes)	EEPROM (KBytes)	SRAM (KBytes)	CPU	ISM Band	Sensitivity (dBm)	Output Power (dBm)	Vcc (V) Range	Clock Speed (MHz)	Green Package	Temp. Range (°C)	Data Rate (kbps)	AES	Antenna Diversity	Application Areas		
															Low Level/ Peer-Peer	ZigBee RF4CE	ZigBee PRO
ATSAMR21E16A	64	emulation	8	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN32	-40 to 125	250KB	x	x	x	x	
ATSAMR21E17A	128	emulation	16	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN32	-40 to 125	250KB	x	x	x	x	
ATSAMR21E18A	256	emulation	32	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN32	-40 to 125	250KB	x	x			x
ATSAMR21G16A	64	emulation	8	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN48	-40 to 125	250KB	x	x	x	x	
ATSAMR21G17A	128	emulation	16	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN48	-40 to 125	250KB	x	x	x	x	
ATSAMR21G18A	256	emulation	32	32-bit ARM Cortex M0+	2.4 GHz	-101	4	1.8 to 3.6	48	QFN48	-40 to 125	250KB	x	x			x
ATmega128RFA1	128	4	16	8-bit AVR	2.4 GHz	-100	-17 to +3.5	1.8-3.6	16	QFN64	-40 to +85 -40 to +125	2 Mb	x	x	x	x	x
ATmega64RFR2	64	2	8	8-bit AVR	2.4 GHz	-100	17 to +3.5	1.8-3.6	16	QFN64	-40 to +85 -40 to +125	2 Mb	x	x	x	x	
ATmega644RFR2	64	2	8	8-bit AVR	2.4 GHz	-100	17 to +3.5	1.8-3.6	16	QFN48	-40 to +85 -40 to +125	2 Mb	x	x	x	x	
ATmega128RFR2	128	4	16	8-bit AVR	2.4 GHz	-100	17 to +3.5	1.8-3.6	16	QFN64	-40 to +85 -40 to +125	2 Mb	x	x			x
ATmega1284RFR2	128	4	16	8-bit AVR	2.4 GHz	-100	17 to +3.5	1.8-3.6	16	QFN48	-40 to +85 -40 to +125	2 Mb	x	x			x
ATmega256RFR2	256	8	32	8-bit AVR	2.4 GHz	-100	-17 to +3.5	1.8-3.6	16	QFN64	-40 to +85 -40 to +125	2 Mb	x	x			x
ATmega2564RFR2	256	8	32	8-bit AVR	2.4 GHz	-100	-17 to +3.5	1.8-3.6	16	QFN48	-40 to +85 -40 to +125	2 Mb	x	x			x
AT86RF212B	-	-	-	-	700/800/900 MHz	-110	-10 to +10	1.8-3.6	-	QFN32	-40 to +85	1 Mb	x	x	x		x
AT86RF231	-	-	-	-	2.4 GHz	-101	-17 to +3	1.8-3.6	-	QFN32	-40 to +85 -40 to +125	2 Mb	x	x		x	x
AT86RF232	-	-	-	-	2.4 GHz	-100	-17 to +3	1.8-3.6	-	QFN32	0 to +70	250	x	x	x	x	
AT86RF233	-	-	-	-	2.4 GHz	-101	-17 to +4	1.8-3.6	-	QFN32	-40 to +85	2 Mb	x	x			x

Development Tools

Product	Description	
ATSAMR21 **Xplained Pro**	The Atmel® SAM R21 Xplained Pro evaluation kit is a hardware platform to evaluate the ATSAMR21G18A microcontroller. Supported by the Atmel Studio integrated development platform, the kit provides easy access to the features of the Atmel ATSAMR21G18A and explains how to integrate the device in a custom design. The Xplained Pro MCU series evaluation kits include an on-board Embedded Debugger, and no external tools are necessary to program or debug the ATSAMR21G18A.	
RF4CE-EK **Evaluation Kit**	The RF4CE-EK demonstrates the unique performance of the Atmel RF4Control—ZigBee RF4CE compliant software stack—in combination with the latest 2.4GHz ATmega128RFA1 system-on-chip solution. For more details, visit www.atmel.com/RF4CE-EK.	
REB212BSMA-EK **Evaluation Kit**	The REB212BSMA-EK demonstrates the unique performance and rich feature set of the Atmel® 700/800/900MHz RF transceiver AT86RF212B combined with the leading edge ATxmega256A3 microcontroller. The REB212BSMA-EK contains two sets of Radio Extender Board (REB), Controller Base Board (REB-CBB) and USB cables to enable PC connectivity. For more details, visit www.atmel.com/reb212bsma-ek.	
REB231ED-EK **Evaluation Kit**	The REB231ED-EK demonstrates the unique performance and rich feature set of the AT86RF231 2.4GHz RF transceiver combined with the leading-edge ATxmega256A3 microcontroller. The REB231ED-EK contains two sets of Radio Extender Board (REB), Controller Base Board (REB-CBB) and RS232 cable to enable PC COM port connectivity. For more details, visit www.atmel.com/REB231ED-EK.	
REB231FE2-EK **Evaluation Kit**	The REB231FE2-EK demonstrates the unique performance and rich feature set of the Atmel AT86RF231 2.4GHz RF transceiver combined with the leading edge ATxmega256A3 microcontroller. The reference design utilizes the SE2431L RF front end module to demonstrate industry-leading link budget of more than 125dB. For more details, visit www.atmel.com/tools/REB231FE2-EK.aspx.	
RF231USB-RD **Reference Design**	The RF231USB-RD demonstrates the unique performance of Atmel AT86RF231 2.4GHz RF transceiver and the ATSAM3S4BA microcontroller. The reference design is made available in an easy-to-use USB stick form factor, and comes pre-flashed with a boot loader and a full set of documentation stored on the onboard external 2Gbit Flash memory. For more details, visit www.atmel.com/tools/RF231USB-RD.aspx.	
REB232ED-EK **Evaluation Kit**	The REB232ED-EK demonstrates the unique performance and rich feature set of the AT86RF232 2.4GHz RF transceiver combined with the leading edge ATxmega256A3 microcontroller. The REB232ED-EK contains two sets of Radio Extender Board (REB), Controller Base Board (REB-CBB) and RS232 cable to enable PC COM port connectivity. For more details, visit www.atmel.com/REB232ED-EK.	
REB233SMAD-EK **Evaluation Kit**	The REB233SMAD-EK demonstrates the unique performance and rich feature set of the Atmel AT86RF233 2.4GHz RF transceiver combined with the leading-edge ATxmega256A3 microcontroller. The REB233S-MAD-EK contains two sets of Radio Extender Board (REB), Controller Base Board (REB-CBB) and USB cable to enable PC connectivity. For more details, visit www.atmel.com/tools/REB233SMAD-EK.aspx.	

Atmel IEEE 802.15.4 Solutions

Product	Description	
ATmega128RFA1-EK1 **Evaluation Kit**	The ATmega128RFA1-EK1 Evaluation Kit enables development, debugging and demonstration of IEEE 802.15.4 compliant wireless applications such as ZigBee. The kit contains two evaluation boards for ATmega128RFA1 covering the 2.4GHz ISM bands for use with STK600. For more details, visit www.atmel.com/ATmega128RFA1-EK1.	
ATmega256RFR2-XPRO **Evaluation Kit**	The ATmega256RFR2 Xplained Pro evaluation kit is ideal for evaluation and prototyping with the ATmega256RFR2 microcontroller. The kit contains one ATmega256RFR2 Xplained PRO board. For more details, visit www.atmel.com/tools/ATMEGA256RFR2-XPRO.aspx.	
ATmega256RFR2-XSTK **Starter Kit**	The ATmega256RFR2 Xplained Pro starter kit is ideal for evaluation and prototyping with the ATmega256RFR2 microcontroller. The kit contains one ATmega256RFR2 Xplained PRO board and a selection of extension boards and cables: • I/O1 Xplained PRO – Provides light sensor, temperature sensor, and microSD Card • OLED1 Xplained PRO – Provides a 128x32 OLED display, 3 LEDs and 3 push buttons • PROTO1 Xplained PRO – Provides easy prototyping on the Xplained PRO platform • 2x USB Cables – Provides PC connection and power For more details, visit www.atmel.com/tools/ATMEGA256RFR2-XSTK.aspx.	
AT256RFR2-EK	The AT256RFR2-EK demonstrates the unique performance and rich feature set of the ATmega256RFR2 2.4GHz SoC. The kit contains two set of Radio Controller Board (RCB) and comes preflashed with performance test software for easy evaluation of the ATmega256RFR2 RF performance. For more details, visit www.atmel.com/tools/ATMEGA256RFR2-EK.aspx.	
Atmel Studio **Design Software**	Atmel Studio is a full featured front-end integrated development environment (IDE) for code development and debugging of Atmel AVR and Cortex™-M based applications. In supporting the Wireless MCUs, a Wireless Composer that is made available through the Extenstion Manager in Studio 6 provides a GUI for the Performance Analyzer Application running on the wireless evaluation kits. For more details, visit www.atmel.com/atmelstudio.	
STK600 **Starter Kit**	Complete programming and development system supporting all AVR microcontrollers via socket adaptors. For more details, visit www.atmel.com/tools/STK600.aspx.	
JTAGICE3 **Debugger**	Atmel JTAGICE3 is a powerful development tool for on-chip debugging of all AVR microcontrollers. For more details, visit www.atmel.com/tools/JTAGICE3.aspx.	

Atmel Corporation 1600 Technology Drive, San Jose, CA 95110 USA **T:** (+1)(408) 441.0311 **F:** (+1)(408) 436.4200 | **www.atmel.com**