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A-TAG™3

User Manual

Preliminary Version 0.10

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Introduction

A-TAG3 is a complete Wi-Fi and networking solution incorporating an RF power amplifier and antenna and includes a 32-bit CPU, operating system, network stack, crypto accelerator, power management subsystem, real-time clock and a versatile sensor interface, allowing it to serve as a networking slave or, with custom software, as a standalone host. In the A-TAG3 modular family is possible to built battery powered custom active RFID tags for Realtime Localization, tracking and remote sensing as different models as different purpose of use any other wi-fi devices with ultra low power usage by Battistoni Research i.e. Industrial and home automation, security, health and fitness monitoring, telemetry within indoors or outdoors area.

This document provides preliminary information on the A-TAG™3 family, for each device models' user manual and/or quick start guide should be read separately in conjunction with this document.

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Chapter 1 User Guide

Summary of functionality:

Main Hardware Features:

Wi-Fi

- Complete 2.4 GHz IEEE 802.11b/g Wi-Fi transceiver at rates up to 54Mbps. Channels 1-14
- 802.11i security suite with WEP-40, WEP-104, WPAv1-PSK, WPA2-PSK, and WPA transitional modes
- High throughput - 4 Mbit/s sustained TCP/IP with WPA2 and 10 Mbps with UDP
- Wi-Fi certifiable with support for WPA2 Enterprise, WMM QoS and WMM Power Save

CPU

- User-programmable 32-bit SPARC V8 clocked at 44 MHz
- On-board ROM contains eCos operating system, LWIP TCP/IP suite, security software and drivers
- EPCglobal Class 1 Generation-2 transceiver, with both read and write capability
- IEC-61000-4-2: unattended recovery from EMC shocks in hostile electromagnetic environments
- ISO 24730-2 compliant 2.4GHz DSSS transmitter and FSK magnetic receiver

RFID and RTLS (Real-time Locating Systems)

- EPCglobal Class 1 Generation-2 transceiver, with both read and write capability
- ISO 24730-2 compliant 2.4GHz DSSS transmitter and FSK magnetic receiver
- Supports Cisco CCX-tag protocols
- Supports Internet protocols including UDP, TCP and HTTP via the included LWIP stack

Sensor Interface

- 14-bit ADC offering 35us conversion time with 0.01% linearity for analog transducers such as temperature and humidity sensors

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- Auxiliary 8-bit DAC
- Low-power interface for monitoring push-buttons, accelerometers, security seals and motion sensors.
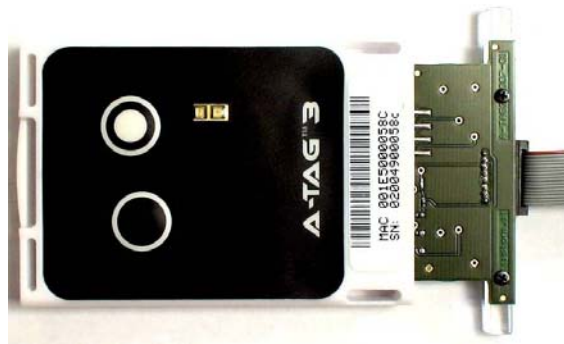
Power Management

- Ultra-low-power sleep state, in which a range of wake reasons can be detected
- Keep alive doze state with instant transition to wake state
- On-board power regulators operate from alkaline, lithium manganese, lithium iron disulphide and other battery types
- Transitions from asleep to CPU-active in 1.7ms; CPU active to network connection in less than 35ms (typ)
- Consumes 4uA current when asleep, 90mW power with Wi-Fi enabled

Environment

- Operates from -30°C to +85°C
- Battery operated, voltage in 2.0 ÷ 3.7 Volts, replaceable
- EMC Resilient : IEC 61000-4-2 compliance in hostile electromagnetic environments with recovery and burnout detector

Other characteristics

- Interface to your favorite microcontroller using UART
- On-board antenna with +18 dBm RF transmit power
- 128 KB RAM
- 1 Mbyte of FLASH EPROM
- 10 GPIOs
- Real-time clock for wake-up and time stamps
- Watch Dog Timer
- Crypto Hardware for AES-128, RC4, MD5, SHA-1 and CRC-32
- Direct battery operation.

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A-TAG3-007 with programming adapter

Pre-loaded Software Features:

- The A-TAG3 is capable of standard Wi-Fi communication, through complete association and authentication, using UDP protocol.
- The A-TAG3, once activate, is already programmed to wake-up and transmit the RSSI values acquired from reachable Access Point (AP) set out with 802.11b/g standard.
- It will ACTIVELY or PASSIVELY scan on channel 1, 6 and 11 of Wi-Fi, for AP with specified SSID, periodically.
- If equipped with temperature sensor, it can be used as Temperature Data Logger, which will send the periodically collected temperature values, together with RSSI data when wake-up and successfully associate to a Wi-Fi network.
- The scan interval as the scan duration and the possible interval of temperature logs, are configurable through Wi-Fi network using UDP messages.
- If equipped with a Motion Sensor, the A-TAG3 can wake-up when the device starts and stops to move.
- If a Motion Sensor is installed, it is also possible set-out a different time interval for wake-up, RSSI scan and messages transmission, according if A-TAG3 is in motion or not. This mechanism will provide a battery life optimization in the case of A-TAG3 is used for Wi-Fi RTLS (Real-time Locating Systems)
- The A-TAG3 can wake-up and associate to a Wi-Fi network, also after a sensor event occur such as a button pressed or released.
- When the A-TAG3 is successfully associated to a Wi-Fi network, end user application can send messages to blink LEDs and give a visual indication or change the functional parameters.

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A-TAG™3 family advantages:

Is intended to provide the user a complete active RFID tag vehicle in which the customer can develop unique software applications for the tag

Possibility to have infrastructure required by an application program for a low power 802.11b/g device

Supports a client architecture for shortest software development time and lowest system costs

Long life battery with ultra-low Wi-Fi power consumption

Complete design- ready to use end devices in available or custom models within the ATAG3 family i.e. flexible mounting and usage options, call buttons, detachment detection, motion sensing, temperature sensing, long battery life, tag management, tag programmability and storage, telemetry, active RFID functionality, other remote sensors, different rugged enclosure designs

Ready to use firmware preloaded or on demand

Ships pre-calibrated and pre-tested for RF and/or temperature sensing usage

Uses existing Wi-Fi and EPC RFID Infrastructure for low TCO

Save time to market for any custom models and/or OEM supply with its pre-certified FCC, CE, IC.

Chapter 2 Compliance

FCC Compliance

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.

Troubleshooting

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 to an outlet on a circuit different from that to which the receiver is connected.
Consult the dealer or an experienced radio/TV technician.
This device complies with Part 15 of the FCC Rules.

Conditions

Operation is subject to the following two conditions:
This device may not cause harmful interference
This device must accept any interference received, including interference that may cause undesired operation.

Markings

To satisfy FCC exterior labeling requirements, the FCC ID must be placed on the exterior of the end product.

Contains FCC ID: XLP-ATAG3

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

FCC Warning Modifications

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC Rules.

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Radio Frequency Exposure

Calculated Safe Distance at 1 mW/cm2 =   5.5 cm
Minimum Separation Distance =   20 cm
A distance greater than or equal to 20 cm from the device should be maintained for safe operation in an uncontrolled environment.

In order to meet the "Radiated Emissions" requirements of FCC 47 CRF Part15.209, each model of ATAG3 family as end-device has been tested and has their own test reports for FCC marking.

CE Compliance

ATAG3 device has been tested to meet R&TT directive issued by the Commission of the European Community and has been tested to confirm the requirements of ETSI EN 300-328

each model of ATAG3 as end device has been tested for the requirements of ETSI standards and has their own test reports for CE marking:

EMC (Electromagnetic Compatibility) EN 301-489-17 (Radiated Immunity: EN 61000-4-3 and ESD: EN 61000-4-2)

"Radiated Emissions" of EN 55022

Safety EN 60950-1, EN 301-489-1

IC - Industry Canada Compliance

ATAG3 has been tested for Industry Canada IC certifications with the compliance against IC RSS 210 and each model of ATAG3 has been secured with their own Radiated Emissions tests separately.

IC: 8500A-ATAG3

A-TAG™3 Certifications:

Radio:

FCC part 15 sub-part C class B
EN 300-328, EN 301-489
IC RSS-210

Safety:

EN 60950-1

For the updated certifications please visit www.battistoni.it

Acronyms and Abbreviations

Term	Definition
ADC	Analog-to-digital converter
AES	Advanced encryption standard
DAC	Digital to Analog Converter.
DSSS	Direct sequence spread spectrum
EPC	Electronic product code
FSK	Frequency shift keying
GPIO	General-purpose input/output
IEEE 802.11b/g	The 802.11b/g standard for wireless local area networks (WLANs) - often called Wi-Fi - is part of the 802.11 series of WLAN standards from the Institute of Electrical and Electronics Engineers (IEEE). 802.11b/g is backward compatible with 802.11. The A-TAG3 implements the IEEE 802.11b/g transmit and receive functions.
RSSI	Received signal strength indication. Measurement of signal strength used by wireless systems to estimate the location of the clients.
RTLS	Real-time Locating Systems
SHA	Secure hash algorithm
TCP/IP	TCP/IP (transmission control protocol/internet protocol) is the basic communication language or protocol of the Internet.
WLAN	Wireless local area network
WMM	Wireless Multi-Media. "WMM" is a registered trademark of the Multimedia Alliance. The Wireless Multimedia Alliance generates specifications and practices which, if followed, lead to greater satisfaction with IEEE 802.11-compliant items.
Wi-Fi	Wireless fidelity. A registered trademark of the Wi-Fi alliance for certain types of wireless local area networks (WLAN) that use specifications conforming to IEEE 802.11.