# ATM3325 Tag Reference Design

## User Guide

**SUMMARY:** This document describes the features and usage of the ATM3325 Tag Reference Design.  ATM3325 Tag is in a compact form factor and can be used in many applications. This document describes how to configure this tag into three applications: Beacon, AoA direction finding tag and Quuppa tag.



Atmosic™

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# Acronyms and Abbreviations

| Acronyms | Definition |
|---|---|
| AoA | Angle of Arrival |
| ATM33 | ATM3330<br>ATM3325 |
| BIDS | Board Identification System |
| LE | Low Energy |
| PCBA | Printed Circuit Board Assembly |
| RDK | Reference Design Kit |
| SDK | Software Development Kit |
| SoC | System-on-Chip |

# 1. Overview

This document describes the features and usage of the Atmosic Bluetooth LE Tag reference design based on the ATM3325 SoC and powered by a CR2032 coin cell battery.

The ATM3325 Tag reference design demonstrates the low power consumption of the Atmosic Bluetooth LE device and many applications in a compact form factor. Three applications can be realized based on this design:

- Beacon
- AoA direction finding tag
- Quuppa tag (will be supported in the future SDK release)

Users can configure the ATM3325 Tag in any of the above three applications according to this guide. This guide also provides information such as the schematic block diagrams, application behaviors, and power consumptions.

The Atmosic Tag Reference Design is provided for demonstration and evaluation purposes only. It is not supported by Atmosic as a commercial product available for retail sale.

The three different applications shown in the document will advertise for 10 minutes and go to SoC Off mode which is the lowest power state. Users can also use a button to control the device to go to SoC Off mode or wake up from SoC Off mode.

# 2. Hardware and Software Requirements

## 2.1 Supported Hardware

See Table 1 for information regarding the supported hardware

| Hardware | SoC Package | SoC Part Number | Design Package Part Number |
|---|---|---|---|
| Atmosic ATM3325 Tag reference design with sensor expansion board (Board A+B, with enclosure) | 40-pin 5x5 mm QFN | ATM3325-5DCAQK | ATMTAG-EXT-3325 |
| Atmosic ATM3325 Tag reference design (Board A only, in enclosure) | 40-pin 5x5 mm QFN | ATM3325-5DCAQK | ATMTAG-3325 |

*Table 1 - Supported Hardware*

## 2.2 Supported Software

Atmosic SDK 5.4.0 or later version is required to operate the ATM3325 Tag reference design.

# 3. Features

## 3.1 Hardware Block Diagram

A simplified hardware block diagram of the complete PCBA is shown in Figure 1, which consists of Board A (see Figure 2) and Board B (see Figure 3).

Board A consists of:

- LIS3DH Accelerometer
- ENS210 Humidity and temperature Sensor
- Push Button
- Two LEDs (red and green)
- ATM3325 Bluetooth LE SoC
- Firmware Program and Debug Interface

Board B consists of:

- Push Button
- One LED (yellow)
- mikroBUS™ socket
- Firmware Program and Debug Interface

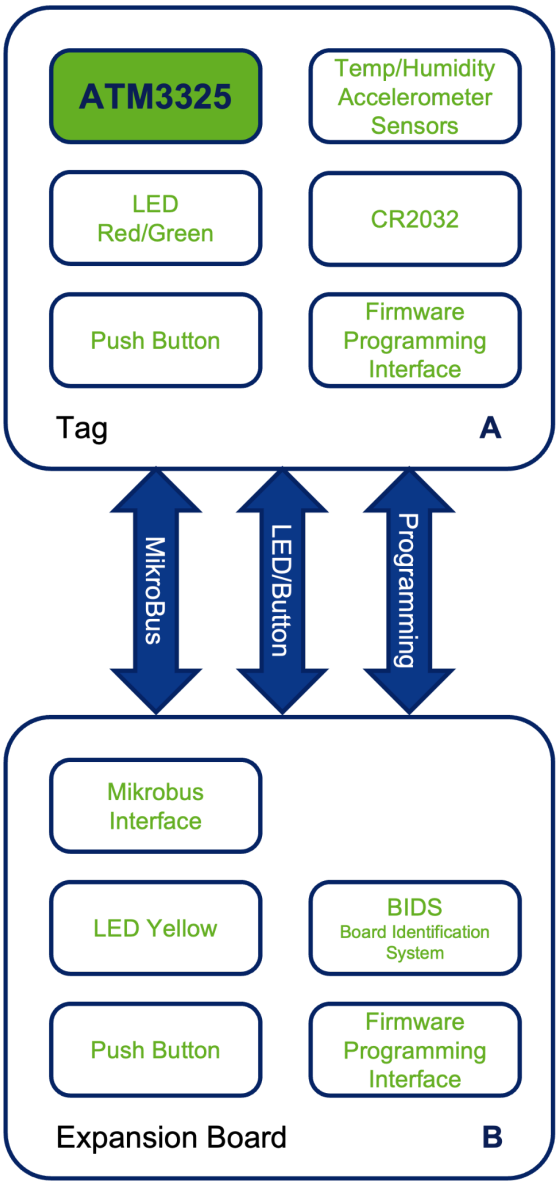


*Figure 1 - ATM3325 Tag Reference Design Block Diagram*

Boards A (Tag) and B (Expansion) are designed to enable developers to optimize its configuration based on requirements. This is intended to provide developers with options:

1) When used together (A+B) a developer can add additional sensors that maybe required for code development unique to their own application
2) When Board A and B are separated, Board A (Tag) can be installed in the enclosure included in the package as a standalone, form-factor tag that can be

used for field testing. To separate Board A from Board B, developers can snap the board at the joint.

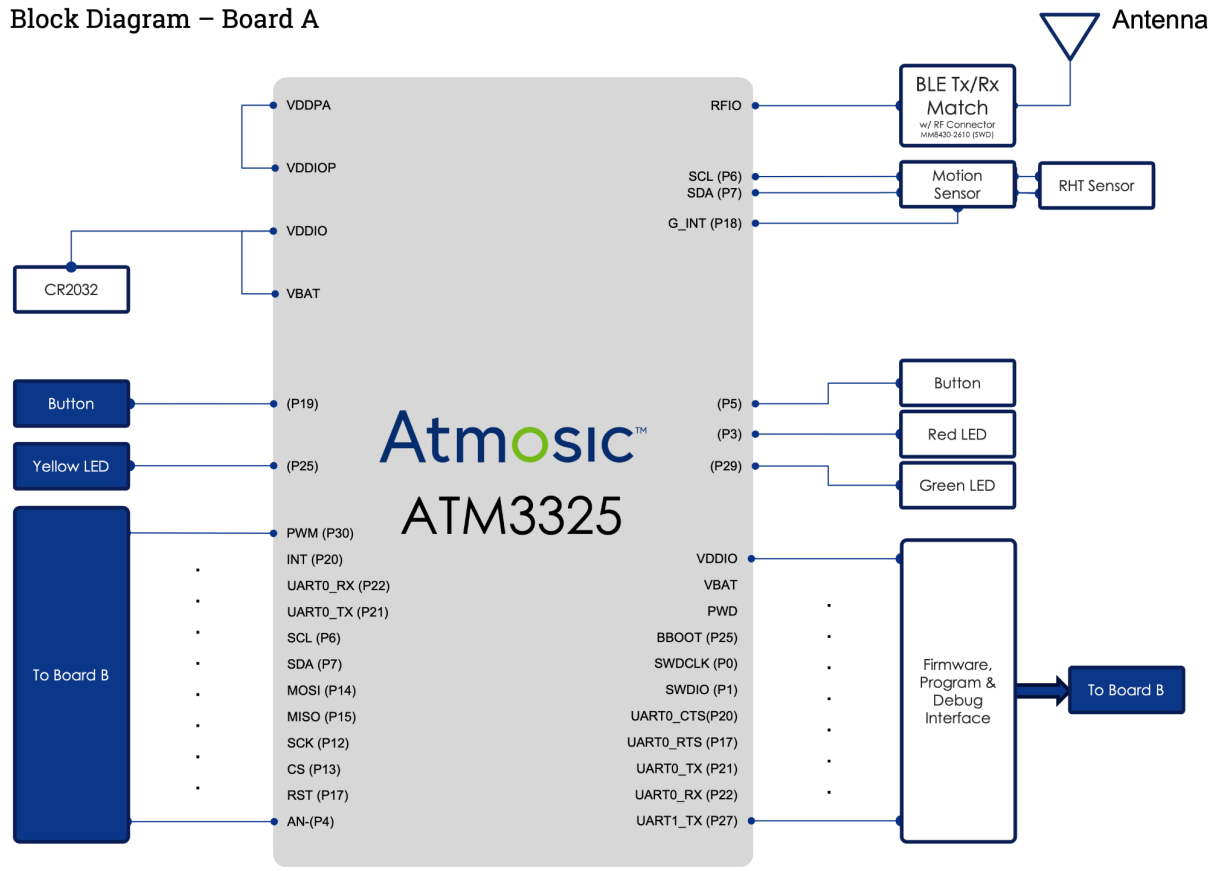


*Figure 2 - Board A Block Diagram*

Block Diagram – Board B

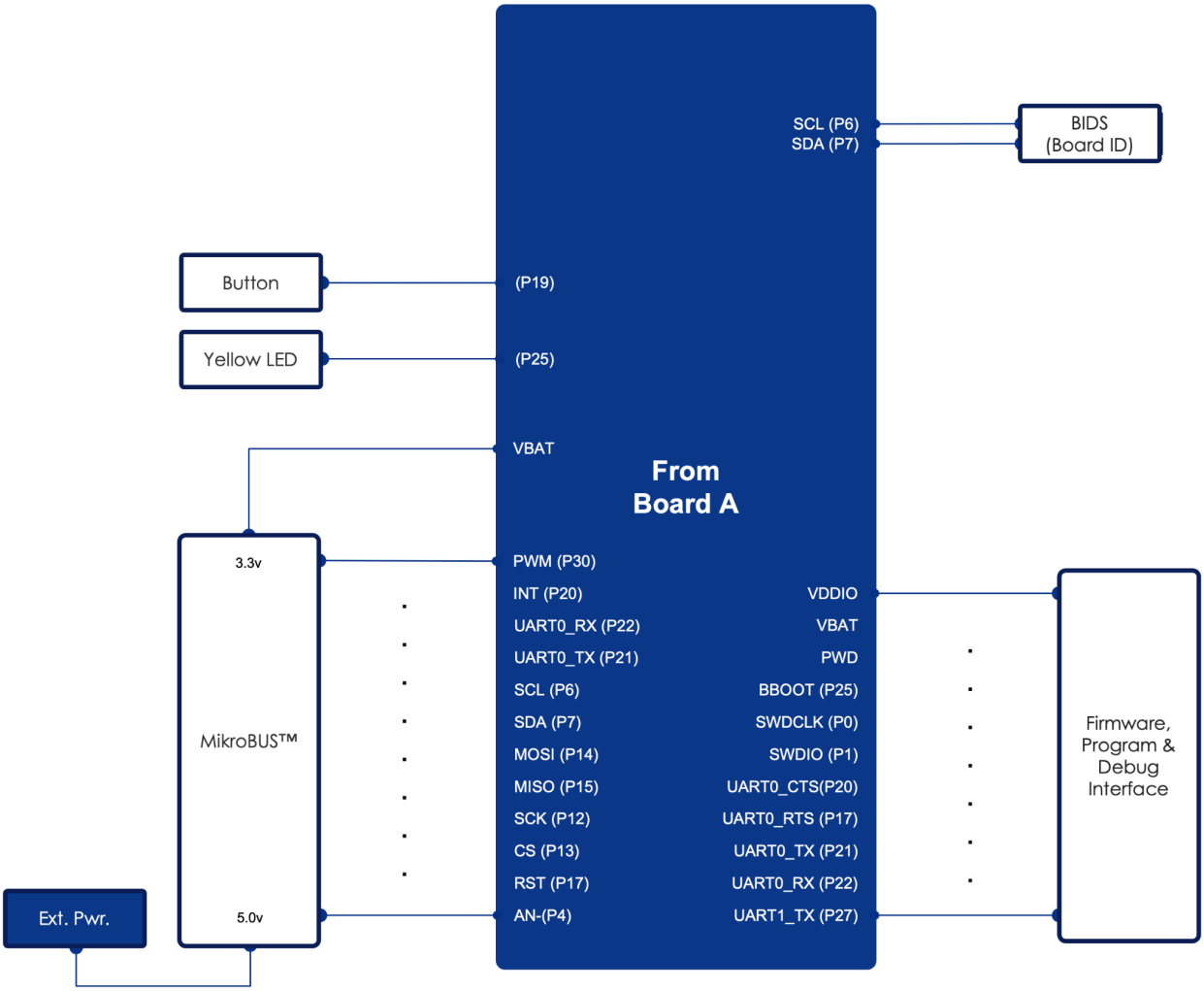


*Figure 3 - Board B Block Diagram*

## 3.2 Tag PCBA

The complete PCBA of the Atmosic Tag reference design is shown in Figure 4. It is a combined PCBA with two parts: Board A (left) and Board B (right). Board A is the main function board and Board B is the extension board, they can be broken off from the vias at the edge of these two parts.

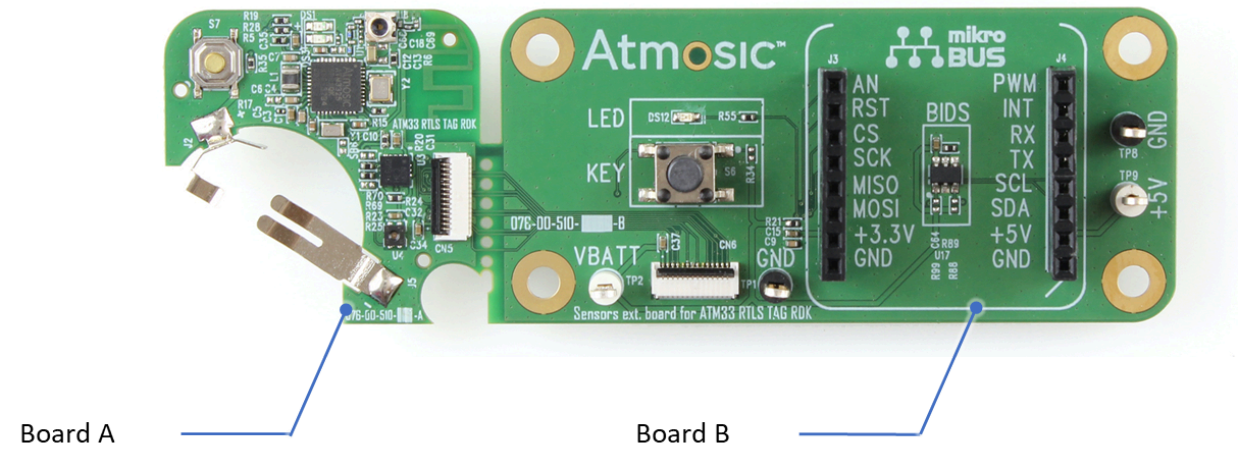


*Figure 4 - ATM3325 Tag (Board A) and the Extension Board (Board B)*

## 3.3 Tag Enclosure

When Board A is broken off from the complete PCBA, it can be assembled into the tag enclosure as shown in Figure 5. The tag enclosure has a press for button and a hole for the LEDs.


*Figure 5 - Tag Enclosure*

## 3.4 Extension Function

Board B is the extension board which provides users with additional peripherals as listed in the Hardware Block Diagram section.

## 3.5 Reference Design Package Options

Two different package options are provided:

- Package ATMTAG-EXT-3325 includes Board A+B and enclosure
- Package ATMTAG-3325 includes Board A in the enclosure

Please refer to Table 1 for details.

# 4. Applications

## 4.1 General Operation

ATM3325 Tag can be used as a generic board in which almost all the applications can be loaded into it. However, there are three examples in the Atmosic SDK: BLE_adv, AOA_dir_finding_tag, and QUUPPA_tag are designed to show the benefit of the Tag.

- BLE_adv is a generic beacon application. This is the default firmware loaded on ATM3325 Tags included in ATMTAG-EXT-3325 and ATMTAG-3325 packages. The beacons can be detected over the air by any Bluetooth sniffer phone app.
- The AOA_dir_finding_tag example is an asset tracking application. It uses connectionless AoA technology and could work with the Atmosic AoA Locator included in the **Atmosic AoA Demo Kit** (ATMAOA-33-KIT, listed in References section) or the third party AoA locator that supports connectionless AoA. AOA_dir_finding_tag is the default application loaded on the ATM3325 Tags included in the Atmosic AoA Demo Kit. For details operation on Atmosic AoA Demo Kit, please refer to **ATM33/e Bluetooth Angle-of-Arrival (AoA) Demo Quick Start Guide** (listed in References section)
- QUUPPA_tag is also an asset tracking application (will be supported in the future SDK release)

In all three examples when enabling CFG_SOC_OFF_DEMO=1, the application advertises for 10 minutes and then goes to SoC Off mode. Users can use the push button (the one on Board A) to control the system to enter SoC off mode or exit from SoC Off mode.

Here is an example of command to build code for AOA_dir_finding_tag:

```
make clean CFG_SOC_OFF_DEMO=1 SWDIF=FTDI SWDBOARD=DL BOARD=ATMEVK_3325_TAG run_all
```

## 4.2 Button Operation

Board A button operation:

| Current Status | Button Operation | Next Status |
|---|---|---|
| Advertising/Idle | Button press for 1 second | SoC Off state |
| SoC Off state | Button press | System in Advertising/Idle state |

*Table 2 - Button Operation Description*

## 4.3 LED Indicator

Board A red/green LED indication:

| Operating State | LED Behavior |
|---|---|
| System start | Green LED blinking 3 times |
| System goes to SOC OFF mode | Red LED blinking 3 times then stops blinking |
| Advertising | Green LED blinking every 30 seconds |

*Table 3 - LED Indicator Description*

## 4.4 Peripherals on Board B

The peripherals on Board B, including mikroBUS™ socket, will be supported in the future SDK release.

# 5. Power Consumption Measurement

The ATM3325 Tag reference design supports direct current consumption measurements to demonstrate the low operating current of the ATM3325 SoC for above mentioned applications.

Users can start the power measurement after supplying +3V from a testing equipment (for example, a DC power meter ) to the marked position +BAT and -BAT in Figure 6.

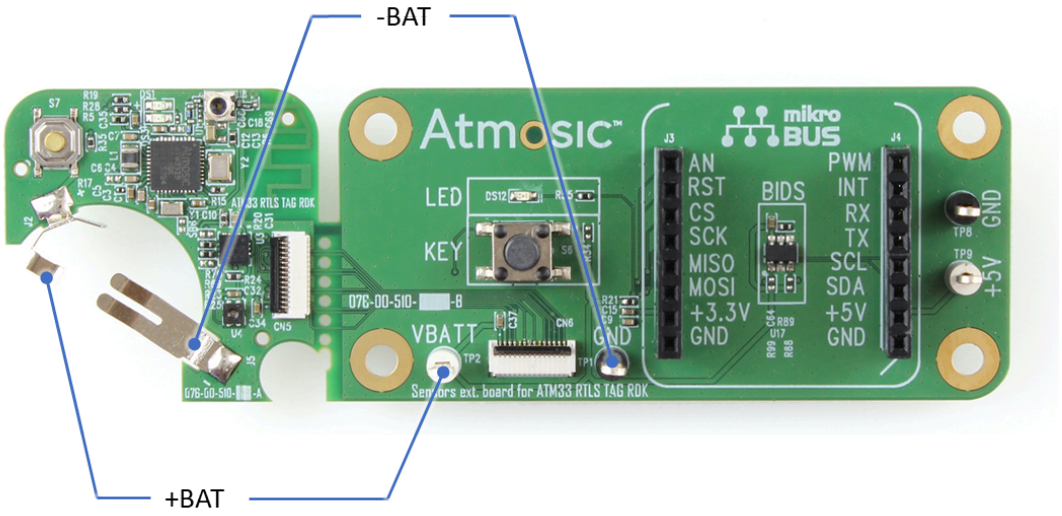


*Figure 6 - External Voltage Supply Connections for Measuring Power Consumption*

# 6. ATM3325 Tag Firmware Update

The ATM3325 Tag reference design has two FFC connectors (one on Board A and the other on Board B) which both can be used for flash programming as well as a debug interface. Please note the FFC connector on Board B will no longer function after Board B is separated from board A. To support the debug and programming functions, additional required hardware (**Reference Design Programming Board, ATMRPB-FJ,** listed in References section) is available from Atmosic. See Figure 7 for a depiction of how this additional hardware is connected.

Please refer to ATM33 RDK Firmware Update section in **Reference Design Programming Board User Guide** (listed in References section) for detailed firmware update procedure.

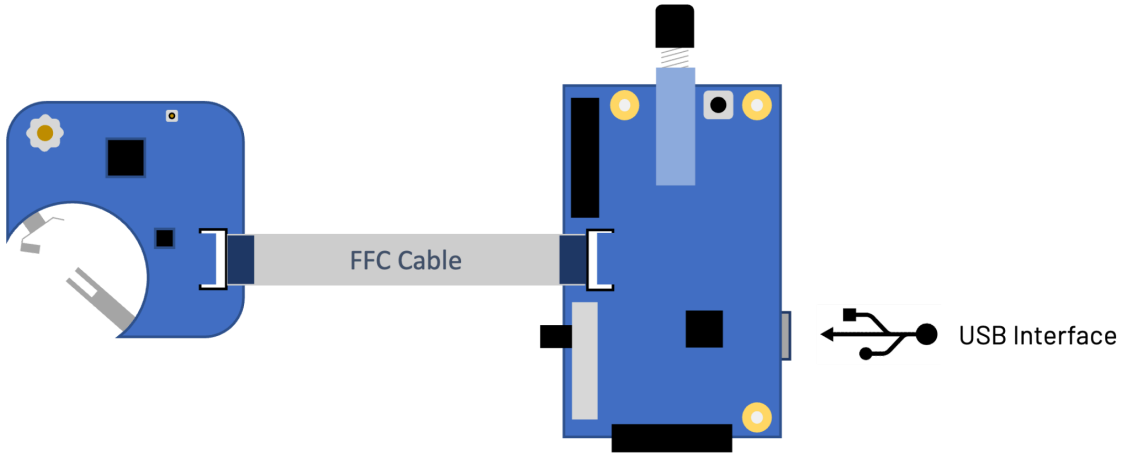


*Figure 7 - Firmware Programming and Debug Connection*

# References

| Title | Document Number |
|---|---|
| ATM33 Series Datasheet | ATM33-DS |
| ATM33/e Series Evaluation Kit User Guide | ATM33_e-UGEVK |
| ATM33/e Series OTA Update Service User Guide | ATM33_e-UGOTA |
| Reference Design Programming Board User Guide | ATM-UGRPB |
| RF Test Tool User Guide | ATM-UGRF |
| SDK User Guide | ATM-UGSDK |
| ATM33/e Bluetooth Angle-of-Arrival (AoA) Demo Quick Start Guide | ATM33_e-QSGAoA |
| **Hardware** | **Order Number** |
| Reference Design Programming Board | ATMRPB-FJ |
| AoA Demo Kit | ATMAOA-33-KIT |

# Revision History

| Date | Version | Description |
|---|---|---|
| June 9, 2023 | 0.50 | Initial version created. |

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