EVK User's Guide for ATMx221

Revision History

Date	Version	Description
June 7, 2019	0.50	Initial version created.
July 9, 2019	0.51	Updated various sections .
August 6, 2019	0.52	Updated various sections, and minor formatting updates.
August 29, 2019	0.53	Updated various sections, and minor formatting updates.
November 7, 2019	0.54	Updated various sections.
February 14, 2020	0.55	Updated Overview, Table 3, Programming the OTP, Programming the Serial Flash, Software configuration, Errata sections.
March 13, 2020	0.56	Corrected typos.
November 20, 2020	0.57	Updated various sections.
March 30, 2021	0.58	Updated Overview.
April 14, 2021	0.59	Updated format, no content change.

Table of Contents

List of Figures

List of Tables

Overview

The Evaluation Kit (EVK) for ATMx221 enables users:

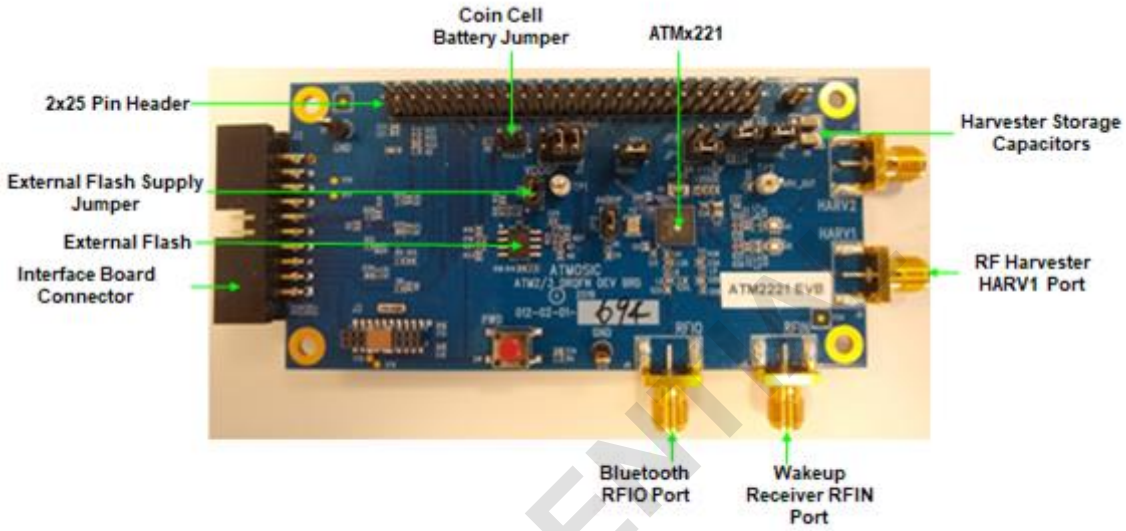
- Measure ATMx221 current consumption
- Validate ATMx221 Bluetooth Low Energy, energy harvesting, and wakeup receiver functionality and performance
- Prototype their own applications on the ATMx221

This guide provides an overview of the Evaluation Board (EVB). To measure ATM2221 power consumption, please refer to the EVK Quick Start Guide - Power Consumption Evaluation document. To validate energy harvesting functionality and performance, please refer to the ATM32x1 EVK Energy Harvesting Quick Start Guide. To use the Atmosic Software Development Kit (SDK) with the EVK, please refer to the SDK Quick Start Guide for ATM2/ATM3 Series document.

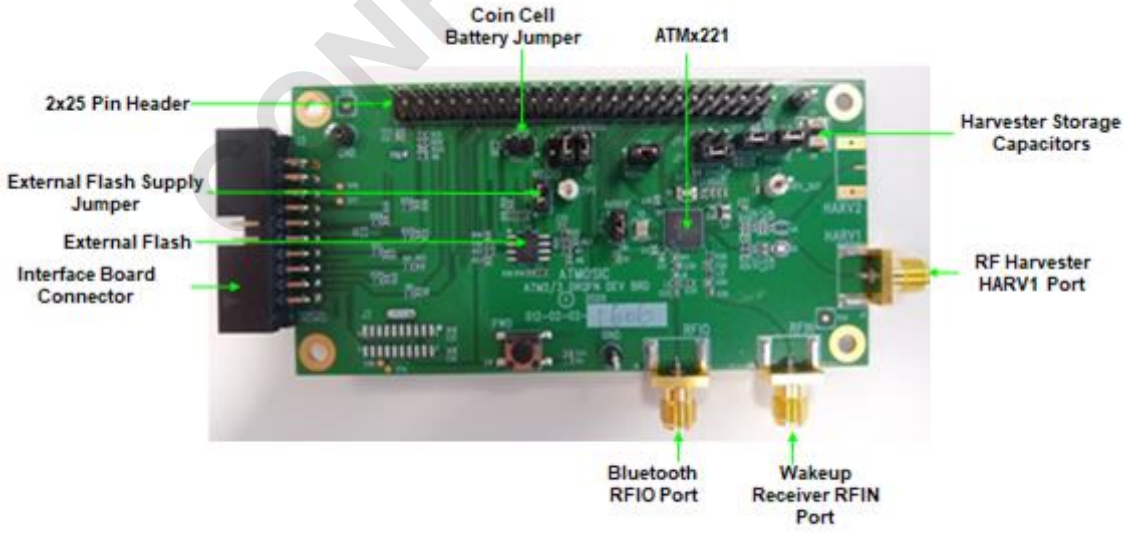
Please note that if the EVB has an ATM2221-x1x or ATM3221-x1x label, it was assembled with an ATMx221-x1x chip. Otherwise, the EVB was assembled with an ATMx221-x0x chip. Refer to the Atmosic Chip Revisions Application Note for information regarding chip revisions.

Evaluation Board Description

Figure 1, and 2 below highlight key elements of current EVB revisions except for the CR2032-sized battery holder, which is on the bottom side of the board.



EVB Revision C/C1



EVB Revision C2x

Figure 1 - EVB Revision C/C1 and C2x

Table 1 - EVB Revision C/C1/C2x Reference Description

Reference	Description
ATMx221	Atmosic Bluetooth system-on-a-chip
	ATM2221 - This variant does not support harvesting
	ATM3221 - This variant supports harvesting
Coin Cell Battery Jumper	This should be shorted when using the battery holder to power the EVB.
2x25 Pin Header	This 2.54 mm pitch 2x25 50-pin male interface is used to connect ATMx221 GPIO's to other devices. Table 2 shows the header pinout.
External Flash Supply Jumper	This jumper should be shorted to use the external flash. If this jumper is open, the ATMx221 will execute from ROM and OTP.
External Flash	This Macronix 4 Mb QSPI flash is used for code and data storage.
Interface Board Connector	This 2.54 mm pitch 2x10 20-pin male interface is used to connect the EVB to an Interface Board.
Bluetooth RFIO Port	A 2.4 GHz antenna should be attached to this SMA connector to validate Bluetooth functionality.
Wakeup Receiver RFIN Port	A 2.4 GHz antenna should be attached to this SMA connector to validate wakeup receiver functionality.
RF Harvester HARV1 Port (ATM3221 only)	A 915 MHz antenna should be attached to this SMA connector to validate RF harvester functionality.
Harvester Storage Capacitors (ATM3221 only)	These capacitors are used to store harvested energy. Please refer to the ATM32x1 Energy Harvesting Application Note for details.

Table 2 - 2x25 Pin Header Pinout for EVB Revision C/C1/C2x

Header Pin(s)	ATMx201/x202 GPIO	Details

1, 27	N/A	GND
2, 50	N/A	VCCIO (same as ATMx221 VDDIO/VDDIOA)
3	P13	Unconnected (Interface Board)
4	P14	Unconnected (external flash)
5	P15	Unconnected (external flash)
6	P16	Unconnected (external flash)
7	P17	Unconnected (external flash)
8	P18	Unconnected (external flash)
9	P19	Unconnected (external flash)
10	P20	
11	P21	
12	P22	
13	P23	
14	P24	
15	P25	
16	P26	
17	P27	
18	P28	
21	P29	
22	P30	
23	P31	
24	P32	
25	P33	
26	N/A	VCC_3V_BD
30	P0	
31	P1	Unconnected (Interface Board)

32	P2	Unconnected (Interface Board)
33	P3	
34	P4	
35	P5	
36	P6	
37	P7	
38	P8	
39	P9	
40	P10	Unconnected (Interface Board)
41	P11	Unconnected (Interface Board)
42	P12	Unconnected (Interface Board)
47	N/A	BBOOT (reserved for internal use)
49	N/A	PWD (reserved for internal use)

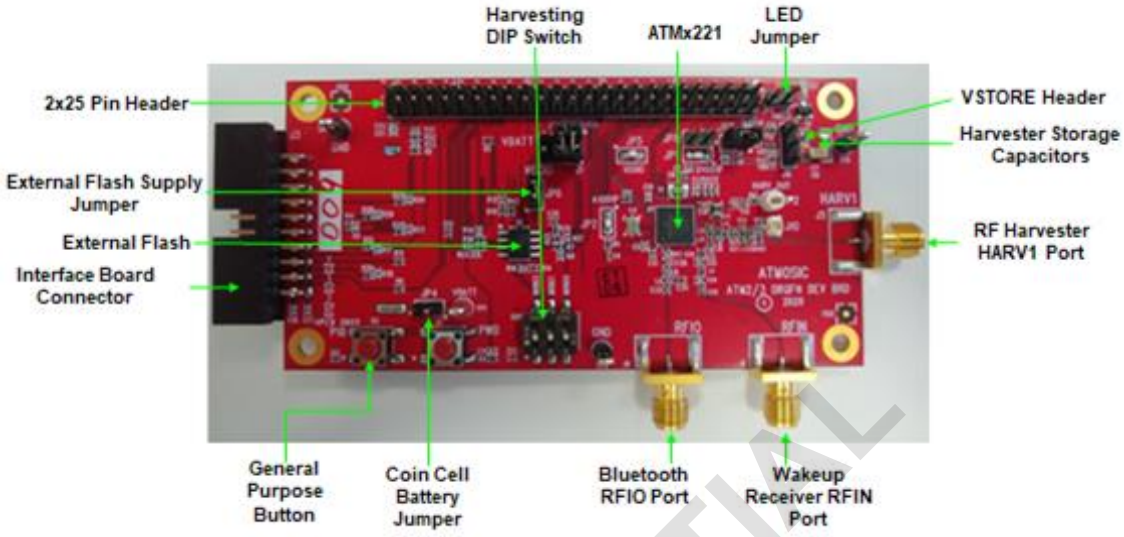


Figure 2 - EVB Revision D3x

Table 3 - EVB Revision D3x Reference Description

Reference	Description
ATMx221	Atmosic Bluetooth system-on-a-chip
	ATM2221 - This variant does not support harvesting and has no embedded flash
	ATM3221 - This variant supports harvesting and has no embedded flash
Harvesting DIP Switch (ATM3221 only)	This switch configures the ATM3221 for different battery types and harvesting modes. Please refer to the ATM32x1 EVK Energy Harvesting Quick Start Guide for details.
2x25 Pin Header	This 2.54 mm pitch 2x25 50-pin male interface is used to connect ATMx221 GPIO's to other devices. Table 4 shows the header pinout.
External Flash Supply Jumper	This jumper should be shorted to use the external flash. If this jumper is open, the ATMx221 will execute from ROM and OTP.
External Flash	This Macronix 4 Mb QSPI flash is used for code and data storage.
Interface Board Connector	This 2.54 mm pitch 2x10 20-pin male interface is used to connect the EVB to an Interface Board.

General Purpose Button	This button is active high and connected to P10 with a pull-down resistor.
Coin Cell Battery Jumper	This should be shorted when using the battery holder to power the EVB.
LED Jumper	This jumper can be shorted to allow P25 to enable the blue LED with an active high signal.
Bluetooth RFIO Port	A 2.4 GHz antenna should be attached to this SMA connector to validate Bluetooth functionality.
Wakeup Receiver RFIN Port	A 2.4 GHz antenna should be attached to this SMA connector to validate wakeup receiver functionality.
RF Harvester HARV1 Port (ATM3221 only)	A 915 MHz antenna should be attached to this SMA connector to validate RF harvester functionality.
Harvester Storage Capacitors (ATM3221 only)	These capacitors are used to store harvested energy. Please refer to the ATM32x1 Energy Harvesting Application Note for details.
VSTORE Header (ATM3221 only)	This header configures the ATM3221 for rechargeable battery or harvesting meter operation. Please refer to the ATM32x1 EVK Energy Harvesting Quick Start Guide for details.

Table 4 - 2x25 Pin Header Pinout for EVB Revision D3x

Header Pin(s)	ATMx201/x202 GPIO	Details
1, 27	N/A	GND
2, 50	N/A	VCCIO (same as ATMx221 VDDIO/VDDIOA)
3	P13	
4	P14	Unconnected (external flash)
5	P15	Unconnected (external flash)
6	P16	Unconnected (external flash)
7	P17	Unconnected (external flash)
8	P18	Unconnected (external flash)
9	P19	Unconnected (external flash)
10	P20	
11	P21	
12	P22	
13	P23	
14	P24	
15	P25	
16	P26	
17	P27	
18	P28	
21	P29	
22	P30	
23	P31	
24	P32	Unconnected (Interface Board)
25	P33	Unconnected (Interface Board)
26	N/A	VCC_3V_BD

33	P3	
34	P4	
35	P5	
36	P6	
37	P7	
38	P8	
39	P9	
40	P10	Unconnected (Interface Board)
41	P11	Unconnected (Interface Board)
42	P12	
47	N/A	BBOOT (reserved for internal use)
49	N/A	PWD (reserved for internal use)

Powering on the EVB

The EVB can be powered on in the following ways:

1. Interface Board
   This method is recommended when using the SDK to program the board. Please refer to the SDK Quick Start Guide for ATM2/ATM3 Series for instructions.

2. Power supply
   This method is recommended when measuring current consumption. Please refer to the EVK Quick Start Guide - Power Consumption Evaluation for instructions.

3. CR2032-sized coin cell battery
   The battery holder is on the bottom side of the board. Insert the battery then load jumper JP4.

4. Energy harvesting (ATM3221 only)
   Please refer to the ATM32x1 EVK Energy Harvesting Quick Start Guide for instructions.

Bluetooth Low Energy RF PHY Testing

RF PHY testing can be performed with a Bluetooth tester by running the 2-wire DTM application provided in the SDK.

EVK setup as shown in Figure 3:

1. Plug the interface board (**red**) into the EVB (**red**).
2. Attach an RF cable to the RFIO port of the EVB (circled in **green**).
3. Attach the other end of the RF cable to the tester.
4. Plug in a USB cable into the USB0 port of the interface board (circled in **blue**).
5. Plug the other end of the USB cable into the tester. The tester should select the second USB0 COM port and be configured to 460800 baud, 1 stop bit, and no parity. If a lower baud rate is desired, modify the setting in the UART0 driver and the tester.

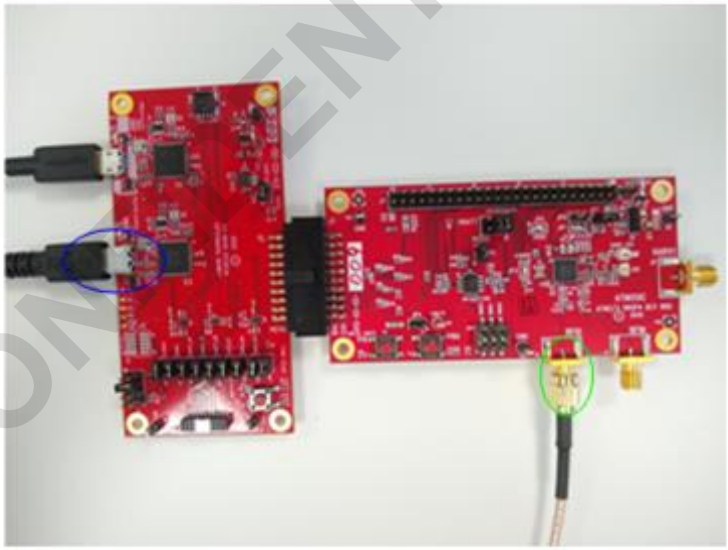


Figure 3 - EVK Setup

RF PHY Performance

Table 5 shows typical EVB results measured with the Frontline TLF3000.

Table 5 - Typical EVB RF PHY Performance

Measured RF Parameter	Measured Value			Unit
	Min	Typical	Max	
Tx Power	2.5	3.5	4.5	dBm
Rx Sensitivity @ 1M	-92	-94	-96	dBm
Rx Sensitivity @ 2M	-90	-92	-94	dBm

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