Application note

BNO055 Xplained pro
Getting Started Guide

Bosch Sensortec

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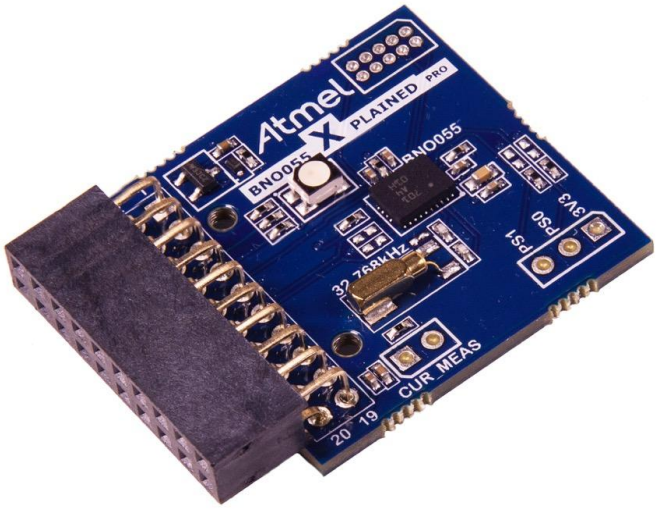

BNO055 Xplained pro: Getting Started Guide

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Contents

1 Preface

The Atmel Xplained Pro evaluation kits can be extended with so-called wing boards. The given documents shall guide the user through the first steps that are required to set up a first demo application with the BNO055 wing board from Atmel. The demo application implemented by *BNO055 Xplained Pro – Data Stream* project reads data from a BNO055 smart sensor and transmits them out to a terminal software in a host computer.

The main intention of the demo application is to be a reference example that shows how to use basic functions of BNO055. It can be extended and altered to implement desired custom use cases.

This document gives instructions how to set up the hardware and software system. It gives the user the necessary hints to see the project running.

2 Step by Step Setup

2.1 Software and Extensions

1. Install the latest version of Atmel Studio from Atmel website
2. Open Atmel Studio
3. Go to “Tools -> Extension Manager” and install the latest version of Atmel Software Framework (Version used in this extension is 3.20.1)
4. Go to “Tools -> Extension Manager” and search for “BNO055 Xplained – Data Stream” extension from Bosch Sensortec GmbH (BST) and install it
5. Go to “Tools -> Extension Manager” and search for “Terminal for Atmel Studio” extension from Atmel and install it (It is no necessary to install this extension if you are going to use another terminal software)
6. Restart Atmel Studio
7. Go to “File -> New -> Example Projects”
8. “Below BST – Bosch Sensortec GmbH” find the project named “BNO055_XPLAINED_PRO_DATA_STREAM – atsamd21j18a”
9. Select it and press “OK” button
10. Read and accept the license agreement and press “Finish” button to create a new example project

2.2 Hardware

11. Connect the *BNO055 Xplained Pro* wing board to *EXT1* extension port of the *SAMD21 Xplained Pro*
12. Connect the micro USB cable to the *EDBG USB* port of the board and connect it to the host computer
13. Wait for the drivers to be installed completely
14. Go to “Start Menu -> Control Panel -> Device Manager”
15. Below “Ports (COM and LPT)” find “EDBG Virtual COM Port” and note the COM Port Number
16. In Atmel Studio go to “Project -> Properties” and select the tab named “Tool”
17. Below “Selected debugger/programmer” select the “EDBG” tool. And select “SWD” as the interface and save the changes.

2.3 Run the Project

18. In Atmel Studio to “Build -> Build Solution”

    The build process should succeed with no errors or warnings.

19. Go to “Debug -> Start Without Debugging”

20. Wait for the process to be done.

    (Notice the “Ready” message below, on the status bar)

21. Go to “View -> Terminal Window”

22. Select the EDBG virtual COM port number that you have previously noted, set Baud to 115200 an select ASCII as terminal’s input format.

23. Press “Connect”

24. Move the board around and check the data on the terminal window

3 Application Overview

For detailed description of application implementation see check the BNO055 Xplained Pro – Data Stream application note.

The application implemented by this project is to read data from a BNO055 smart sensor and transmits them out to a terminal software in a host computer.

This project is implemented on an Atmel evaluation board which is expanded by an Atmel BNO055 extension board (also known as BNO055 wing board). Figure 1 shows the hardware set. The wing board is connected to EXT1 port of the main board.

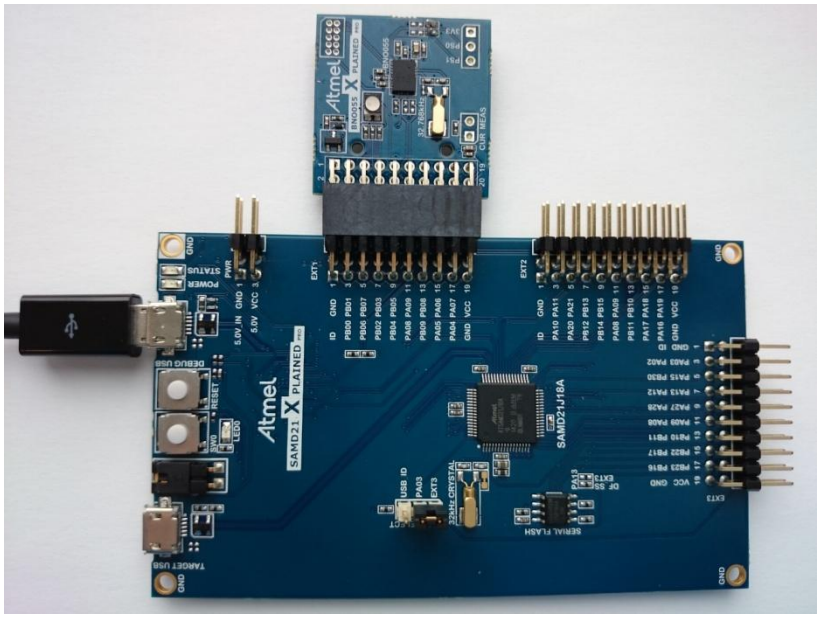

Figure 1 - Main and Extension board connections

BNO055 is a 9-axis smart sensor, which integrates a microcontroller and three orientation sensors (accelerometer, magnetometer, and gyroscope) in a package.

The MCU on the main board reads sensor data via an I2C bus. The I2C bus has a baud rate of 400 KHz and sensor data is requested on a period of 100 ms (can be changed). Raw sensor data is then transmitted using UART with baud rate of 115200 bps to the embedded debugger unit (EDBG). EDBG supports a USB Communication Device Class (CDC), which features a virtual COM interface on the device. Output can be read on a terminal software connected to this virtual COM port as shown in Figure 2. Atmel Studio terminal extension can be used here.

Sensor data in this project are the Euler angles, namely Heading (Yaw), Roll and Pitch. Output stream is printed on the terminal in **ASCII** format in an order depicted on Figure 2.

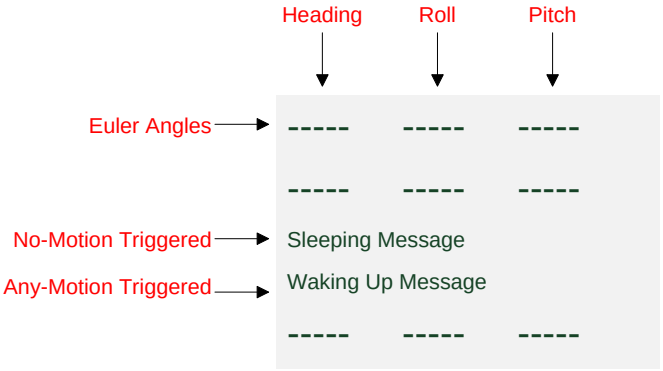

Figure 2- Terminal output for Sensor Data Stream

The sensor also reacts to motion/ no-motion by generating interrupts. If the sensor is left still, the data stream stops. In order to restart the stream the *any-motion* interrupt of the sensor should be triggered. Therefore the board has to be moved or rotated. Data Stream will continue until a *no-motion* interrupt is triggered, i.e. the sensor in not moved for some time. The movement threshold and waiting time to trigger interrupts can be configured by altering the code.

Figure 3 illustrates the sleep state transition of the system and Table 1 - RGB LED Colors shows RGB LED state in different states. In AWAKE mode BNO055 is operational, Euler data is read and printed on the terminal window and the LED color changes due to the orientation state of the sensor. In SLEEP mode BNO055 sleeps, data stream stops and the LED turns green. After reset the system is in AWAKE mode.

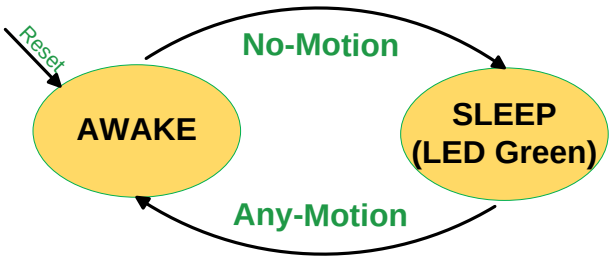

Figure 3 - Sleep State

Table 1 - RGB LED Colors

Color	SLEEP Mode	AWAKE Mode
Red	OFF	Proportional to Pitch
Blue	OFF	Proportional to Heading
Green	ON	OFF

4 References

Atmel Studio Documents

http://www.atmel.com/tools/atmelstudio.aspx?tab=documents

Atmel Gallery

https://gallery.atmel.com/

Atmel-42220: SAM D21 Xplained Pro Evaluation Kit User Guide

http://www.atmel.com/Images/Atmel-42220-SAMD21-Xplained-Pro_User-Guide.pdf

Atmel-42096: Microcontroller Embedded Debugger (EDBG) User Guide

http://www.atmel.com/images/atmel-42096-microcontrollers-embedded-debugger_user-guide.pdf

5 Legal disclaimer

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6 Document History and Modifications

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