Application Note

BMF055
Extension Board – User guide

Bosch Sensortec

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Contents

1 Preface

This document is a user guide to setup the BMF055 application board. It describes the modules on the board and shows the necessary connections to program the chip and run the reference examples provided by Bosch Sensortec. The examples can be downloaded on Atmel Gallery.

2 Components

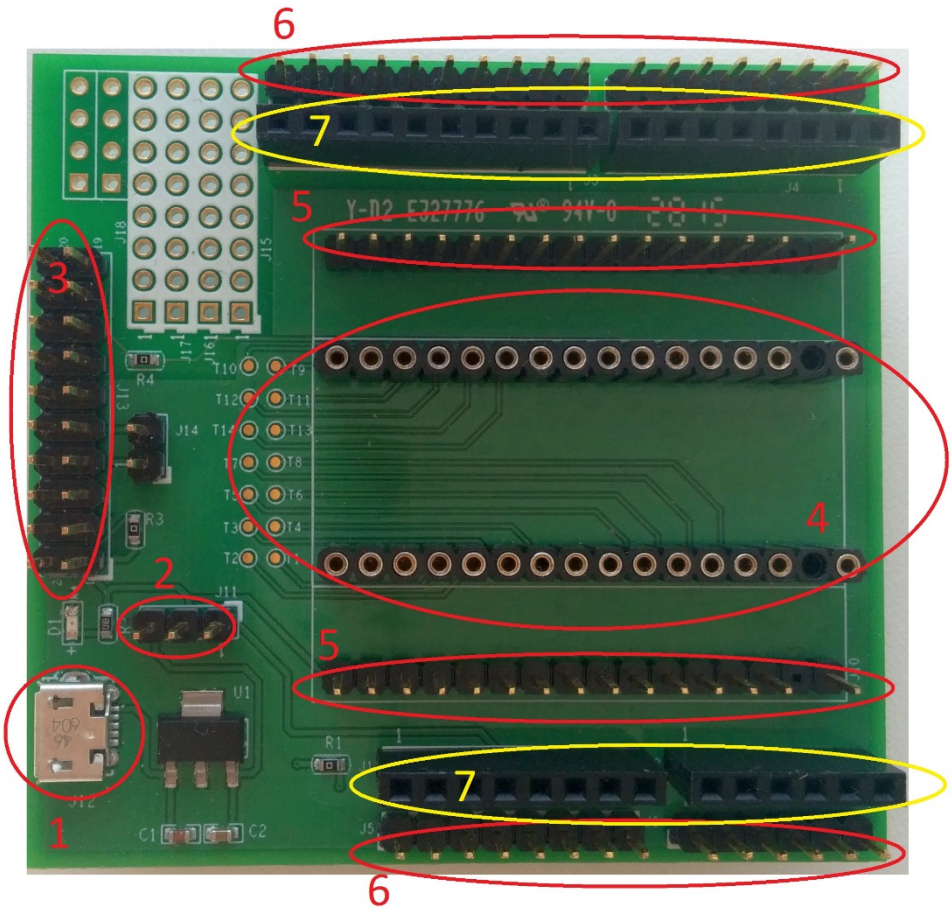

Figure 1 - BMF055 application board's compinents

1 – USB Power Connecter

2 – Power source selection pins (USB/ Arduino)

3 – Programmer/ Debugger JTAG Connector

4 – BMF055 shuttle board connector

5 – Customization pins connected to shuttle board connector

6 – Customization pins connected to Arduino pins

7 – Arduino Connector

2.1 Power

The board can be powered either via a USB cable or an Arduino board. In the former case a jumper should connect pins number 2 and 3 of the power source selection pins. In the latter case a connection between pins 1 and 2 are required.

2.2 Arduino

BMF055 application board can be connected to an Arduino board as a shield. The male connectors at the bottom side provide this possibility. As shown in Figure 2 further shields can also be connected to the female connectors.

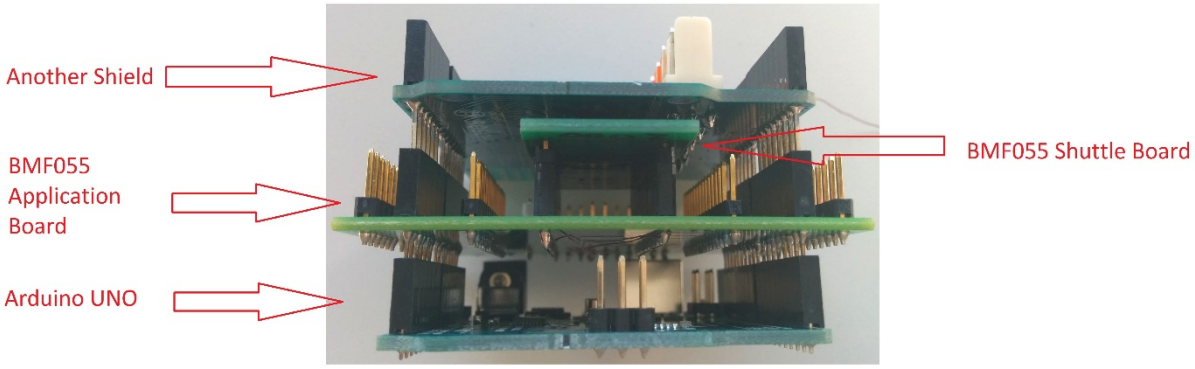

Figure 2 - Connected to Arduino UNO and another shield

2.3 Customization

The only connections to the Arduino and Shuttle board connectors on the board are VDD and GND. The other pins are left unconnected so that users can customize how they desire. There are the two sets of male connectors available on the board: The inner set (Number 5 in Figure 1) is connected to the shuttle board pins in a one-to-one manner and the outer one (Number 6 in Figure 1) is connected to the Arduino pins in the same manner. These connectors can be used for the customization.

3 Necessary Connections

3.1 Shuttle board

The BMF055 shuttle board should be plugged in to the socket on the application board in a way that pin number 1 of the shuttle is connected to the pin number 1 of the socket.

3.2 Power

Either a USB connection or a connection to an Arduino board is required to provide power for the board.

3.3 Power jumper

If the application board's power is provided by an Arduino board the jumper J11 must connect pins number 1 and 2.

Otherwise, if a USB cable provides the power, the jumper J11 must connect pins number 3 and 2.

3.4 Programmer/ debugger connection

To program the microcontroller in BMF055 a programmer/ debugger is required. The board has a standard JTAG connector to for this purpose.

4 Connections for Reference Examples

In the reference examples provided by BST, the chip uses a USART interface to communicate to a host computer or another MCU. It receives commands and sends messages via USART. The pin assignment is given in Table 1.

Table 1 - USART Pin Assignment

Shuttle Board Pin #	Description
17	Tx
18	Rx

Figure 3 shows the necessary connections to power-on and program the sensor to run all reference examples. For more information refer to the examples' application notes.

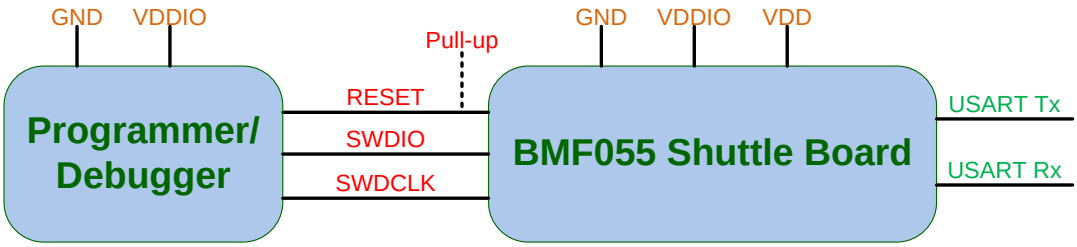

Figure 3 - Minimum Necessary Connections

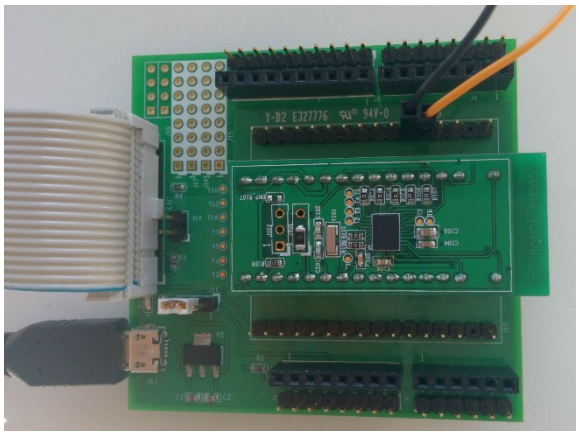

Figure 4 - Necessary connections to run reference examples

5 Quick Setup for Reference Examples

This chapter gives step by step instructions on how to start running this example on a BMF055 Shuttle Board.

5.1 Software and Extensions

1. Install the latest version of Atmel Studio from Atmel website
   - Open Atmel Studio
2. Go to "Tools -> Extension Manager" and install the latest version of Atmel Software Framework (Version used in this extension is 3.26.0)
3. Go to "Tools -> Extension Manager" and search for "BMF055 Shuttle Board – *[Example]*" extension from Bosch Sensortec GmbH (BST) and install it
4. Go to "Tools -> Extension Manager" and search for "Terminal for Atmel Studio" extension from Atmel and install it (It is not necessary to install this extension if you are going to use another terminal software)
5. Restart Atmel Studio
6. Go to "File -> New -> Example Projects"
7. "Below BST – Bosch Sensortec GmbH" find the project named "BMF055_SHUTTLE_BOARD_*[EXAMPLE]* – atsamd20j18a"
8. Select it and press "OK" button
9. Read and accept the license agreement and press "Finish" button to create a new example project

5.2 Hardware

10. Establish the minimum necessary connections; including power, reset and programmer/debugger.
11. Establish a USART connection between the shuttle board and a host computer*. Use bridges if necessary.
12. Install required drivers for your virtual COM port.
13. Go to "Start Menu -> Control Panel -> Device Manager"
14. Below "Ports (COM and LPT)" find the virtual COM port that you are going to use and note the COM Port Number
15. In Atmel Studio go to "Project -> Properties" and select the tab named "Tool"

* It is assumed that the shuttle board would be interfaced to a terminal software running on a host computer.

16. Below “Selected debugger/programmer” select the “SAM-ICE” tool. And select “SWD” as the interface and save the changes.

5.3 Run the Project

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

    The build process should succeed with no errors or warnings. (Figure 5)

18. Go to “Debug -> Start Without Debugging” (Figure 6)

19. Wait for the process to be done.

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

20. Run and connect the required software (e.g. Terminal) on the host computer if required

5.4 Check the Use-case*

21. Check the application as explained in the example’s application note.

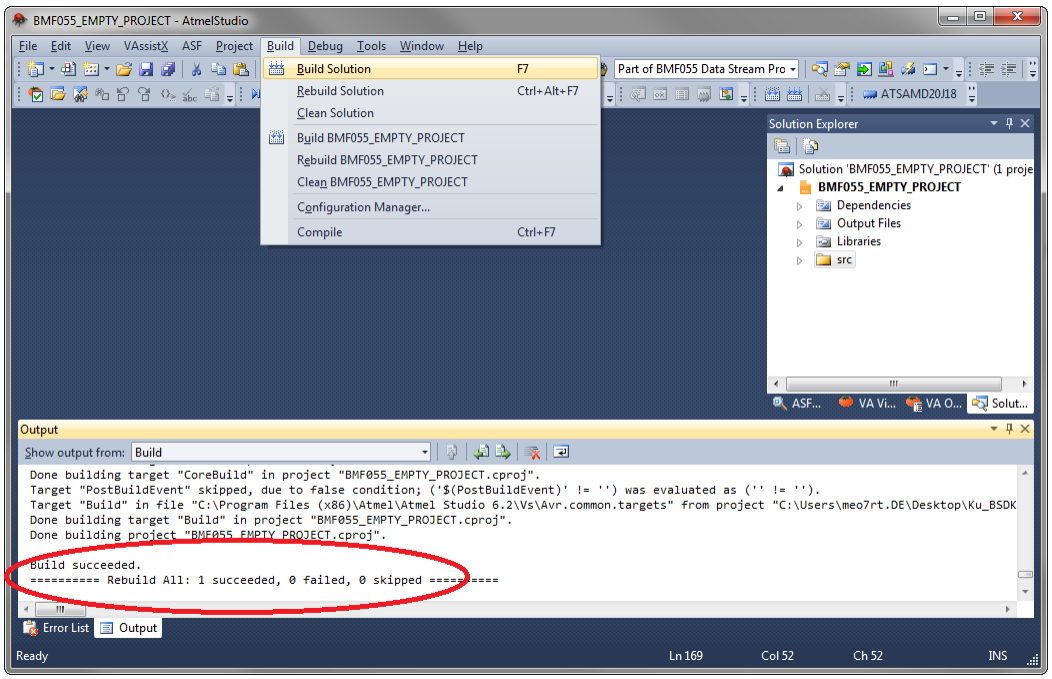

Figure 5 - Build Project

* For detailed information refer to **Error! Reference source not found.**.

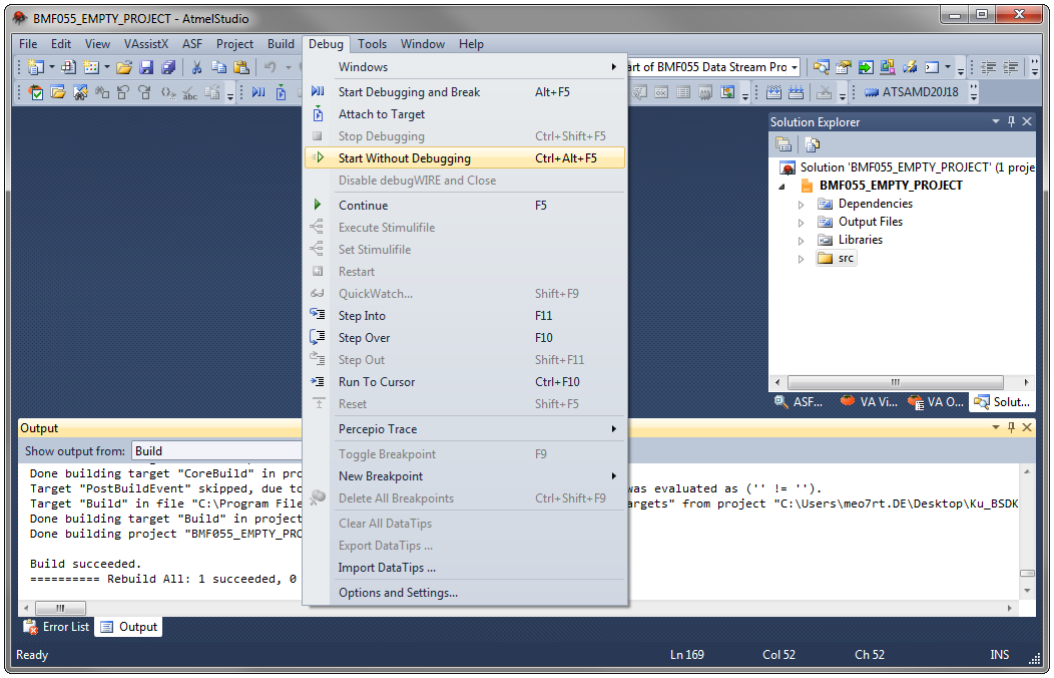

Figure 6 - Start without Debugging

6 BMF055 Shuttle Board

Bosch Sensortec BMF055 shuttle board is a PCB with a BMF055 Orientation Sensor mounted on it. It has the required decoupling capacitors, an external 32 KHz crystal and its load capacitors and allows easy access to the sensors pins via a simple socket.

Table 2 - BMF055 Shuttle Board Pin-out

Pin No.	Pin Name	BMF055 Pin Connected	SAMD20 Pin Connected	Description
1	VDD	3		VDD
2	VDDIO	28	-	VDDIO
3	GND	2, 25	-	GND
4	MISO	-	-	DNC
5	MOSI	-	-	DNC
6	SCK	-	-	DNC
7	CS	-	-	DNC
8	IO5/INTA	6	PB00	GPIO
9	IO0	5	PB01	GPIO
10	COD_GND	-	-	DNC
11	COD_GND	-	-	DNC
12	COD_GND	-	-	DNC
13	COD_GND	-	-	DNC
14	IO1	4	PB02	GPIO
15	IO2	16	PA22	GPIO
16	IO3	15	PA23	GPIO
17	SDA	20	PB16	GPIO
18	SCL	19	PB17	GPIO
19	IO8	11	RESET	RESET
20	INTB/IO6	10	PA28	GPIO
21	INTC/IO7	14	PA24	GPIO
22	IO4	17	PA21	GPIO
23	COD_GND	-	-	DNC
24	COD_PULL	-	-	DNC
25	COD_GND	-	-	DNC
26	COD_GND	-	-	DNC
27	COD_PULL	-	-	DNC
28	COD_PULL	-	-	DNC
29	SWCLK	8	PA30	Debugging CLK
30	SWDIO	7	PA31	Debugging IO

The shuttle board can be plugged into Bosch Sensortec development tools, custom designed boards or breadboards.

6.1 Power

BMF055 has two distinct power supply pins:

- VDD is the main power supply for the internal sensors
- VDDIO is a separate power supply pin used for the supply of the MCU and the digital interfaces

The voltage supply range for VDD is 2.4V to 3.6V and for VDDIO is 1.7V to 3.6 V.

For the switching sequence of power supply VDD and VDDIO it is mandatory that V_{DD} is powered on and driven to the specified level before or at the same time as V_{DDIO} is powered ON. Otherwise there are no limitations on the voltage levels of both pins relative to each other, as long as they are used within the specified operating range.

6.2 Programming/ Debugging

Programming and debugging of the chip is done Serial Wire Debug Interface available. Any debugger that supports the interface can be used. (e.g Atmel SAM-ICE)

7 References

Atmel-42129-SAM-D20_Datasheet

http://www.atmel.com/Images/atmel-42129-sam-d20_datasheet.pdf

8 Legal disclaimer

8.1 Engineering samples

Engineering Samples are marked with an asterisk (*) or (e) or (E). Samples may vary from the valid technical specifications of the product series contained in this data sheet. They are therefore not intended or fit for resale to third parties or for use in end products. Their sole purpose is internal client testing. The testing of an engineering sample may in no way replace the testing of a product series. Bosch Sensortec assumes no liability for the use of engineering samples. The Purchaser shall indemnify Bosch Sensortec from all claims arising from the use of engineering samples.

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8.3 Application Examples and Hints

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9 Document History and Modifications

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