DWM3000EVB

QUICK START GUIDE

Product Overview

The Qorvo® DWM3000EVB is an Arduino form-factor compatible shield designed for the evaluation of the Qorvo® DWM3000 UWB module.

The DWM3000 module is based on the DW3110 UWB transceiver, which allows both Channel 5 and Channel 9 UWB operation.

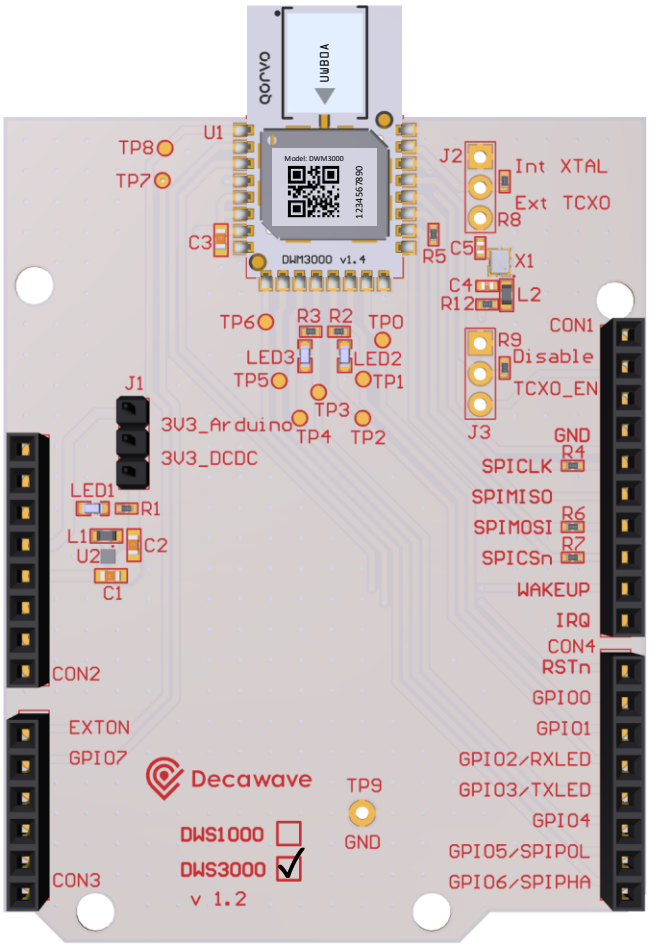
The DWM3000EVB offers flexibility to use the DWM3000 with an MCU of choice. The Arduino form-factor is supported by many MCU vendors such as ST Micro, Nordic Semiconductors and others. This document describes the connection of the single DWM3000EVB to a supporting MCU platform.

Key Features

- Arduino form-factor compatible
- Based on the DWM3000 module with:
- Qorvo® DW3110 UWB IC
- Ceramic UWB antenna
- On board 3V3 DC-DC
- 2.54 mm jumper for selection of the power supply and current consumption measurements
- All module pins are accessible on the Arduino connectors
- Schematics available in PDF format
- Example firmware available on website:
    - STM32CubeIDE project for the ST Nucleo-F429ZI development board
    - Segger Embedded Studio project for the Nordic NRF52840-DK development board

Applications

- Bring up and evaluation of the DWM3000 module.
- General purpose hardware for UWB RTLS system development



Arduino compatible shield

Ordering Information

Part Number	Description
DWM3000EVB	DWM3000 Evaluation board

1 Connecting the DWM3000EVB to a development board

The DWM3000EVB is supplied as a universal “shield”, which can be connected to a range of different MCU platforms.

Thanks to the Arduino compatible connector, the DWM3000EVB can be easily mounted on a variety of MCU development boards. Its ad-hoc standardized extension connector is supported by many vendors and it is widely used on microcontroller evaluation and development kits.

Since the Arduino shield connector is not a strictly defined standard, some microcontroller development boards might have alterations that prevent the DWM3000EVB from being used successfully. Always check the documentation before connecting the DWM3000EVB to a development board.

2 DWM3000EVB Shield Arduino connector pinout

The table below illustrates the top-down view of the DWM3000EVB shield pins and how they are assigned to the Arduino pins. See the DWM3000 and DW3000 datasheets for more information on the functionality of the pins.

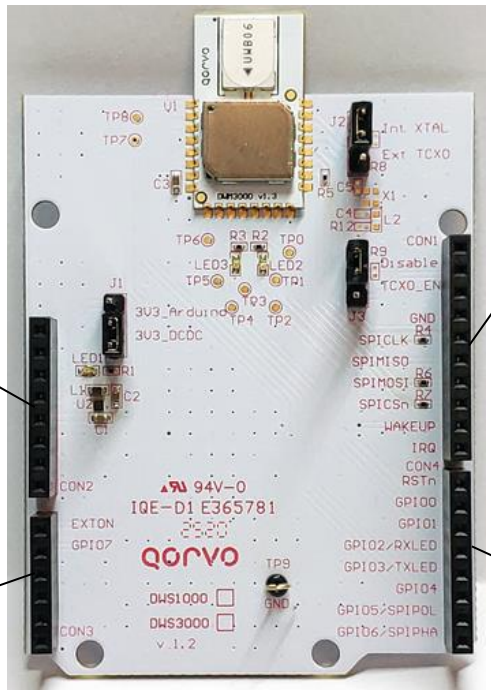
Table 1 DWM3000EVB Pinout

CON2

NC
NC
NC
3V3
5V
GND
GND
NC

CON3

EXTON
GPIO7
NC
NC
NC
NC



CON1

NC
TCXO_EN*
NC
GND
SPI CLK
SPI MISO
SPI MOSI
SPI CSn
WAKEUP
IRQ

CON4

RSTn
GPIO0
GPIO1
GPIO2 / LED2
GPIO3 / LED3
GPIO4
GPIO5**
GPIO6**

Table 2 DWM3000EVB Test Points

Test point	DW3000 Signal
TP0	GPIO0
TP1	GPIO1
TP2	GPIO2
TP3	GPIO3
TP4	GPIO4
TP5	GPIO5**
TP6	GPIO6**
TP7	GPIO7
TP8	EXTON
TP9	GND

** The TCXO_EN pin is reserved for future use. The TCXO is left unpopulated on the DWM3000EVB. The DWM3000 does not support an external clock source. See the schematic for more information.*

*** Note that the initial engineering samples **DWS3000 E1.0** used a DWM3000 v1.3.and in these samples GPIO5 and GPIO6 are reversed. See section 5 DWM3000 Engineering Samples.*

3 Evaluation of the DWM3000EVB on the hardware reference platform

The DWM3000EVB software package is designed to be evaluated using the MCU development platforms listed in **Error! Reference source not found.** below. The NUCLEO-F429ZI development platform from ST Microelectronics requires hardware modifications, which are described in the following section.

Table 3 DWM3000EVB Evaluation Hardware Reference platforms

Development platform	Supplier	HW modification required
NUCLEO-F429ZI	ST Microelectronics	Yes
nRF52840-DK	Nordic Semiconductors	No

3.1 NUCLEO-F429ZI

The DWM3000EVB can be connected to many ST development platforms. The supplied software examples package is made for and tested on the NUCLEO-F429ZI platform.

3.2 Mandatory hardware modification of the NUCLEO-F429ZI

The NUCLEO-F429ZI shares an SPI MOSI pin connected to the Arduino shield with an Ethernet PHY chip.
To use both the Ethernet and SPI1 on the NUCLEO-F429ZI development board, the MOSI pin of SPI1 must be changed from the default PA7 pin to the PB5 pin.
This is done by opening the SB121 solder bridge and shorting the SB122 solder bridge on the bottom of the development board, see below.

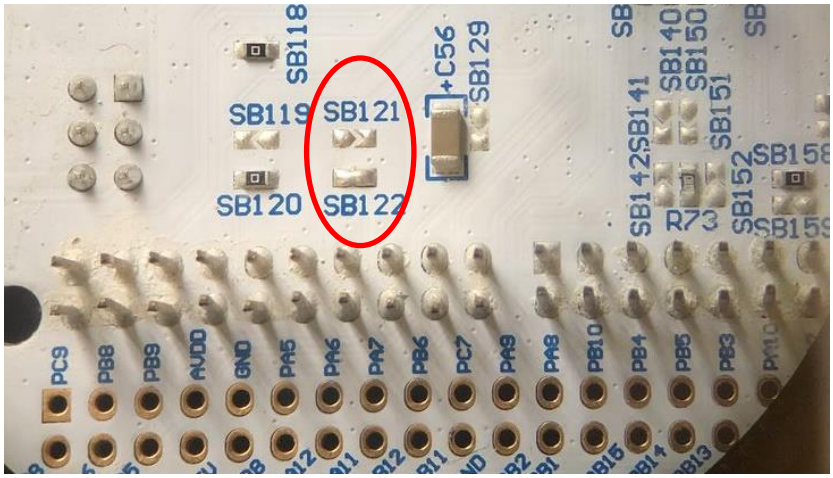


Figure 1: SB121/SB122 modification of the NUCLEO-F429ZI develoment board

For more details refer to table 12 in UM1974, “STM32 Nucleo-144 boards User manual”, Rev 7[1].

[1] https://www.st.com/resource/en/user_manual/dm00244518-stm32-nucleo144-boards-stmicroelectronics.pdf

3.3 Optional hardware modification of the NUCLEO-F429ZI

The NUCLEO-F429ZI development board has two USB ports. The first, labelled CN1, is used for programming and debugging. The second, labelled CN13 ("User USB") is connected to the microcontroller's USB subsystem.

The reference software uses the "User USB" for the virtual COM port interface to the external PC Terminal application. However, on the NUCLEO-F429ZI it is not possible to power the development board from the CN13 connector without hardware modifications.

To allow the "User USB" port to power the development board, the 5V from the user USB port has to be wired to the "E5V" rail of the NUCLEO -F429ZI by soldering a wire between the "+" side of C54 and the "E5V" pin of CN11.

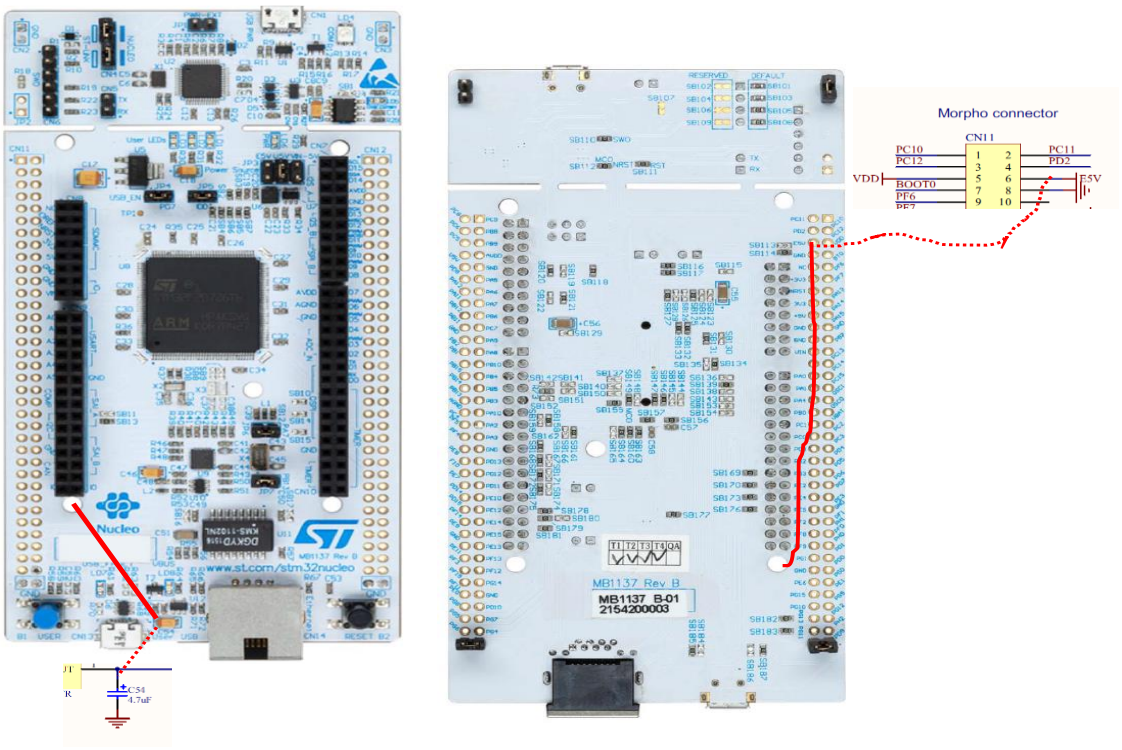


Figure 2 User USB E5V modification of the NUCLEO-F429ZI

By setting the JP3 jumper to the "E5V" position the development board can now be powered by the "User USB" port. The jumper can be set back in the "U5V" position to power the board from the ST-link debugger.

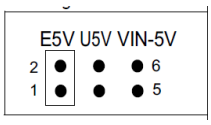


Figure 3 NUCLEO-F429ZI JP3 with jumper in E5V position

3.4 ST-link breakout board

The NUCLEO-F429ZI has an embedded ST-link debugger on a breakaway section of the development board. This debugger is located underneath the antenna of the DWM3000EVB, which slightly impacts the performance of the UWB antenna.

It is possible to remove the ST-link breakout section to allow a better validation of the DWM3000EVB antenna performance but doing so would remove the 8MHz clock source connection to the MCU.

It is possible to modify the software to use the internal clock of the MCU. Alternatively, a crystal oscillator and accompanying load capacitors can be placed on the X3, C37 and C38 footprints of the development board.

3.5 nRF52840-DK

The DWM3000EVB can be connected to most Nordic nRF5 development boards. The DWS3000 examples are originally designed for the nRF52840-DK and use USB-CDC on the MCU native USB port.

3.5.1 SPI speed of the Nordic microcontrollers

The DWM3000 module supports a 38 MHz SPI bus clock. The speed of the SPI may be critical for timings in certain applications.

The maximum SPI speed of Nordic nRF52 series microcontrollers varies from 8 to 32 MHz. The nRF52840-DK supports a 32 MHz SPI clock speed, however the long SPI wiring in the layout of this development board to Arduino extension requires a high drive level to ensure proper operation.

3.5.2 Mounting the DWM3000EVB on the nRF52840-DK

On the Nordic nRF52840-DK, care should be taken when mounting any of the Arduino-type extensions to the development board. The middle header on the nRF52840-DK is higher than the Arduino extension connectors.

Due to the proximity or risk of contact between the boards, the middle header can be trimmed if desired. Otherwise, the shield can be raised with an additional female-male extension connector.

4 Jumpers on the DWM3000EVB

The DWM3000EVB has three jumpers labelled J1, J2 and J3.

- Only J1 is populated and can be used as described below.
- J2 and J3 are left unpopulated and are reserved for future use.

4.1 Jumper J1: selecting the DWM3000 power supply

Jumper J1 on the DWM3000EVB can be used to select the power supply source of the DWM3000.

J1 jumper position	Power source
“Up”, pin 2 and 3 shorted	3V3 pin from the Arduino connector
“Down”, pin 1 and 2 shorted	3V3 DC/DC on the DWM3000EVB

This connector can also be used to power the DWM3000 from an external power supply using the centre pin (pin 2) of the J1 connector. The GND connection can be made using the GND test point (TP9) or one of the GND pins on the Arduino connector.
Refer to the DWM3000 datasheet for information on the supported VDD voltage and current requirements.

4.2 Jumper J1: measuring the DWM3000 current consumption

The J1 connector can be used to measure the current consumption of the DWM3000.

A current measurement instrument should be connected between pin 2 of the J11 connector and the power supply.

Note that this current measurement occurs at the “high side”, meaning care should be taken not to connect any of the pins to GND through the measurement device.

5 DWM3000 Engineering Samples

DWM3000 engineering samples (ES) have known issues that were resolved on the final mass production (MP) version. These issues do not prevent evaluation of the module and can be worked around using firmware adjustments. The DWM3000 ES should only be used for proof of concept and development purposes, they are not suited for use in final product production.

The model information on the label of the DWM3000 indicates whether the module is an engineering sample or a mass production part and it indicates the version of the engineering sample. The model is DWM3000 in case of mass production parts, DWM3000.E1.0 or DWM3000E1.1 in case of engineering samples.

Table 4 DWM3000 Engineering samples overview

Version	PCB version (silkscreen)	Label information	Known issues
ES1.0	DWM3000 v1.3	DWM3000.E1.0	GPIO5 and GPIO6 swapped. 100nF VDD decoupling capacitors left unpopulated.
ES1.1	DWM3000 v1.4	DWM3000.E1.1	100nF VDD decoupling capacitors left unpopulated.

6 Revision History

Revision	Description
A	Initial product release as DWM3000EVB

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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Email: customer.support@qorvo.com

Important Notice