QM33120WDK1
USER GUIDE

Product Overview

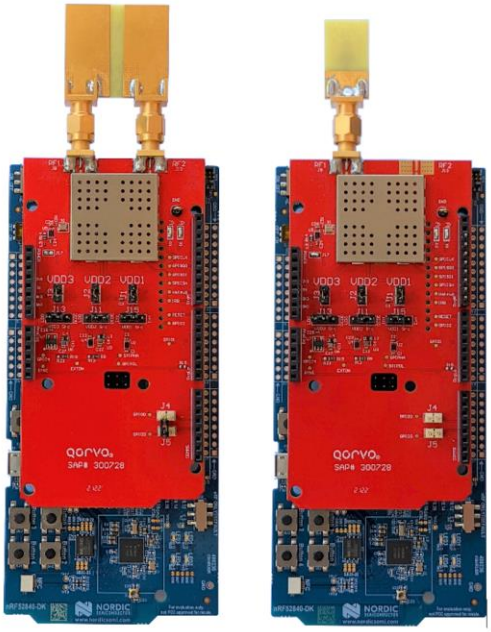
The Qorvo® QM33120WDK1 is a development kit for the low power low cost QM33110W and QM33120W UWB transceivers.

This kit can be used to evaluate the hardware performance of the devices in TWR, TDoA and AoA systems and can help to build an evaluation real time location system (RTLS).

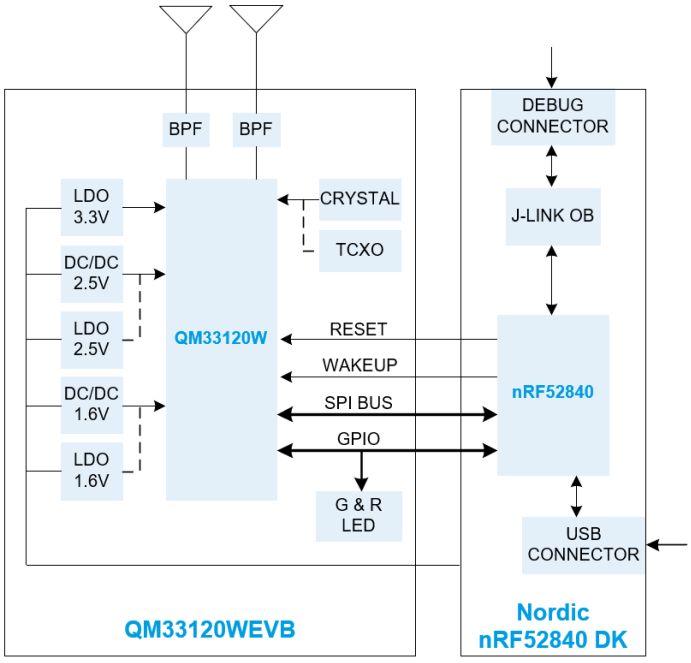
It also enables the development of applications based on DW3110, DW3120, DW3210, DW3220 UWB transceivers.

It includes two different daughter boards (AoA and non-AoA) mounted on two Nordic nRF52840 DK evaluation boards. Application firmware development is facilitated by the features of the Nordic boards such as on-board J-Link debugger, USB and Bluetooth® Low Energy interfaces.

The QM33120WDK1 is designed to develop applications compatible with PHY and MAC FiRa specifications.



QM33120WEVB Block Diagram



Key Features

- Convenient kit for evaluation of QM331x0W transceivers
- Daughter boards compatible with Nordic nRF52840 DK
- Provided with UWB CH5/CH9 dual and single antennas
- Access to all QM331x0W GPIOs and interfaces
- Headers on power traces to measure transceiver currents
- Software development with free to use IDE and debugger
- nRF52840 DK evaluation board with:
  - nRF52840 Soc with Bluetooth 5.3
  - USB interface
  - Integrated BLE antenna
  - J-Link on-board for debugging and flashing via USB
- Supports UWB RF bands 5 (6.5 GHz) and 9 (8 GHz)
- IEEE 802.15.4-2020 and IEEE 802.15.4z-2020 BPRF compliant
- Allow development of FiRA compatible applications
- Works with Apple Nearby Interaction software
- Software suite compliant with FiRa PHY/MAC specification

Applications

- Development of point-to-point applications including tag and anchor
- Software provided for low power TWR and AoA based systems
- Supports Apple Nearby Interactions applications

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1 Overview

The QM33120WDK1 kit content is listed in the following table:

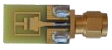
Item	Quantity	Description	
QM33120WEVB	1	Daughter board with QM33120W UWB transceiver Node of AoA system – can measure angular position and distance (Arduino Shield format)	
QM33110WEVB	1	Daughter board with QM33110W UWB transceiver Tag of AoA system – can measure distance (Arduino Shield format)	
Nordic nRF52840 DK	2	Development board for nRF52840 SoC (Cortex M4 with BLE support)	
JL359	1	Directional dual antenna designed for channel 5 and 9 AoA applications	
JL159	1	Omnidirectional single antenna designed for channel 5 and 9 Recommended for a tag in AoA applications	
Micro USB cables (Micro B to Type-A)	2	USB cable to connect nRF52840 DK board to a PC	
Plastic stand	2	Keeps the nRF52840 DK board in a vertical position	
Standoff	6	Allows to fix the nRF52840 DK board on the plastic stand	

Table 1 : Kit Content

Note that none of these parts can be ordered separately. They will only be sold as kits.

QM331x0WEVB board and nRF52840 DK board are shipped connected.
Screw the antennas on each QM331x0WEVB board paying attention to the antenna orientation. It is recommended to use a 1 N*m torque wrench to attach the antenna to the QM331x0WEVB boards, for example HUBER+SUHNER 74_Z-0-0-21.
Attach the nRF52840 DK boards to their plastic stands using the included standoff.
Connect both nRF52840 boards to a PC using the included USB cable and refer to the section QorvoOne GUI.

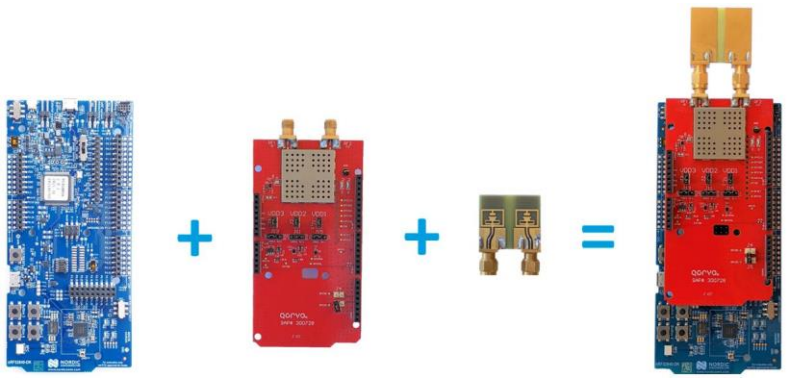


Figure 1 : Kit Assembly

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2 Nordic nRF52840 DK configuration

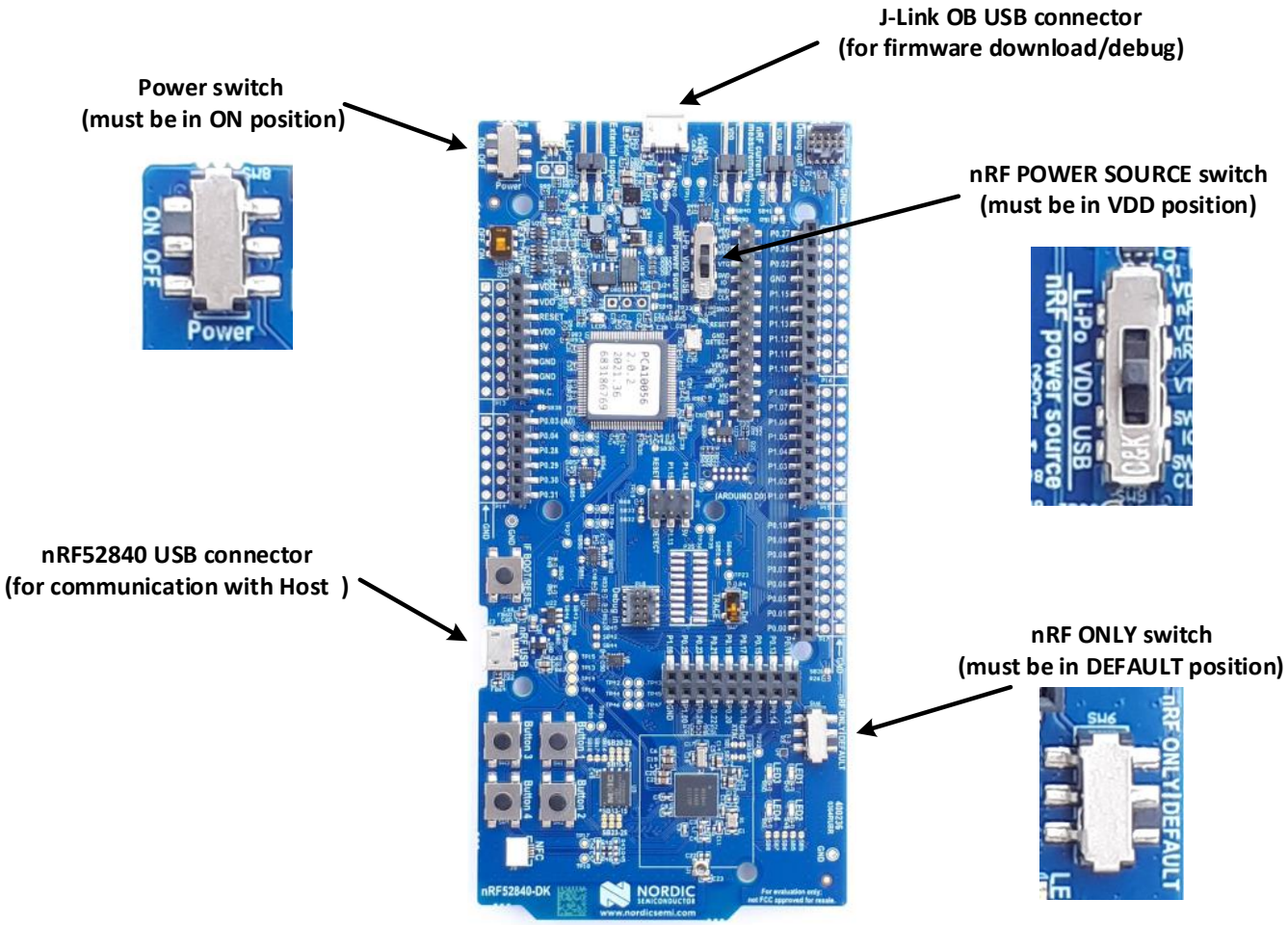

Figure 2 : nRF52840 DK configuration

J-LINK OB (On-Board Debug Probe) is an integrated programming and debugging tool and should be connected to the Host used to program or debug the nRF52840 firmware with Segger J-Link and Segger Embedded Studio software.

Figure 3 : J-Link OB

For normal operation, the Host should be connected to nRF52840 SOC through the nRF52840 USB connector.

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3 Firmware update

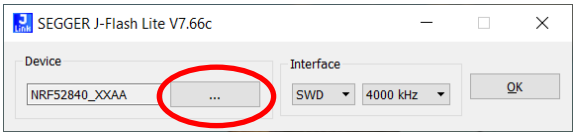
The nRF52840 DK boards are shipped preprogramed. However, to ensure you are using the latest firmware, please check the Qorvo website for any updates.

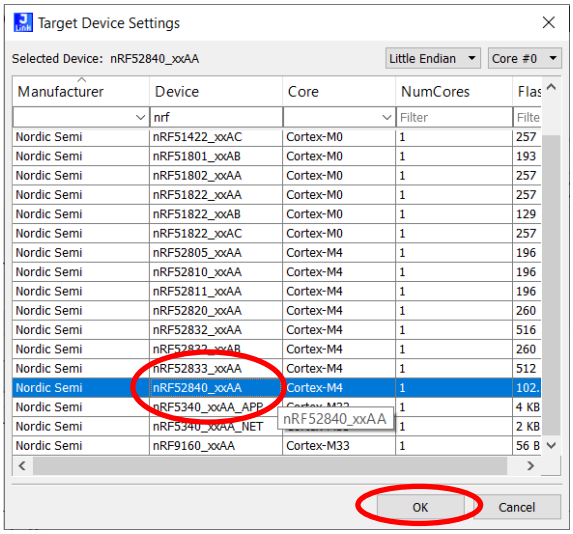
Download Segger J-Link software from this web page: **https://www.segger.com/downloads/jlink/**

Install the J-Link package to your PC.

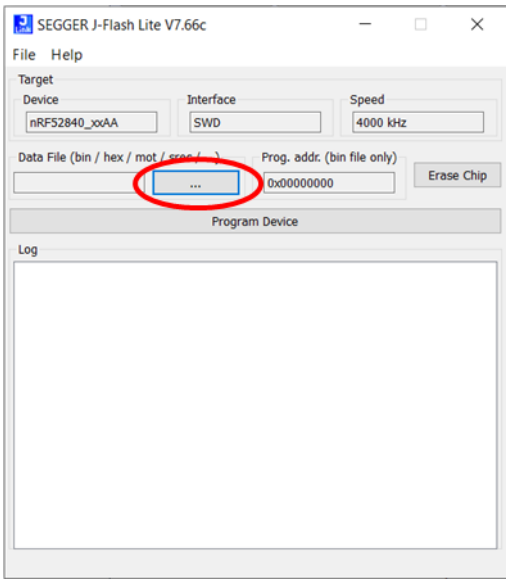
Connect the J-Link OB USB connector of the nRF52840 DK boards (see previous section) to the PC and run Segger J-Flash Lite software.

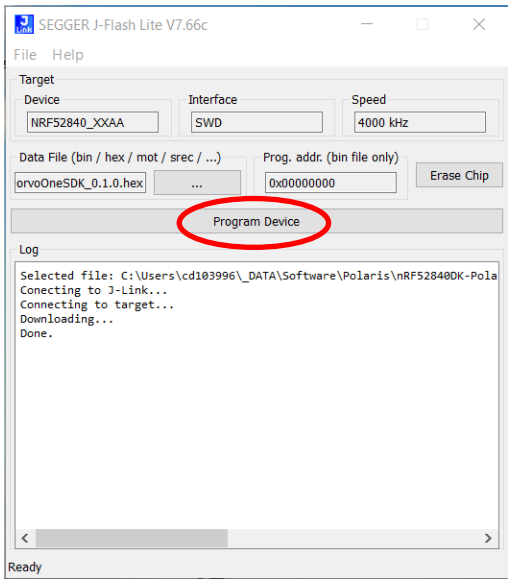
Click on "…" button. Select the target device (nRF52840_xxAA) and click on OK button.





Select the file to download (*.hex) in the nRF52840 flash memory and then click on "Program Device" button.





4 QM331x0WEVB Power Options

QM331x0W transceiver can be powered by DC/DC or LDO.
Using DC/DC improves the power efficiency while LDO reduces the power supply noise.
By default, the transceiver is powered by DC/DC.

Nbr	Name	Default position	Description
J1	VDD1	Closed	Can be used to measure VDD1 current
J2	VDD2	Closed	Can be used to measure VDD2 current
J3	VDD3	Closed	Can be used to measure VDD3 current
J11	VDD2 source	DC/DC	Source of VDD2 power rail – VDD2 can be powered by a 2.5V DC/DC or a 2.5V LDO
J13	VDD3 source	DC/DC	Source of VDD3 power rail – VDD3 can be powered by a 1.6V DC/DC or a 1.6V LDO
J15	VDD1 source	INT	Source of VDD1 power rail – VDD1 can be powered by a 3.3V LDO or by nRF52840 DK board

Table 2 : QM331x0WEVB Power Options

5 QM331x0WEVB Solder Bridge Jumpers

The following table lists the solder bridge jumpers of the QM331x0WEVB.

Solder Bridge	Default State	Description
R3	Open	Connect the TCXO output to QM331x0W oscillator input – When closed, R4 & R5 must be removed
R4	Closed	Connect the quartz crystal to QM331x0W oscillator input – When closed, R3 must be removed
R5	Closed	Connect the quartz crystal to QM331x0W oscillator output – When closed, R3 must be removed
R9	Closed	Connect EN signals of VDD2 DC/DC and LDO to the input power supply – Remove R13 when R9 is closed
R13	Open	When closed, EN signals of VDD2 DC/DC and LDO are driven by EXTON – Remove R9 when R13 is closed
R14	Closed	Connect EN signals of the TCXO LDO to the input power supply – Remove R15 when R14 is closed
R15	Open	When closed, EN signal of TCXO LDO is driven by a GPIO of nRF52840 DK – Remove R14 when R15 is closed
R19	Closed	Connect EN signals of VDD3 DC/DC and LDO to the input power supply – Remove R23 when R19 is closed
R23	Open	When closed, EN signals of VDD3 DC/DC and LDO are driven by EXTON – Remove R19 when R23 is closed
J17	Open	Close it to power the LDO that provides power supply to the TCXO
J21	Open	Do not close – used to make the QM331X0WEVB compatible with a former microcontroller DK
J22	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK
J23	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK
J24	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK
J25	Open	Do not close – used to make the QM331X0WEVB compatible with a former microcontroller DK
J26	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK
J32	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK
J33	Closed	Do not open – required to make QM331X0WEVB compatible with nRF52840 DK

Table 3 : Solder bridges and their purposes

They are mainly used:

- to connect either a Crystal Quartz or a TCXO to the QM331x0W transceiver (see figure below)
- to keep the compatibility of QM331x0EVB daughter board with a former microcontroller evaluation board

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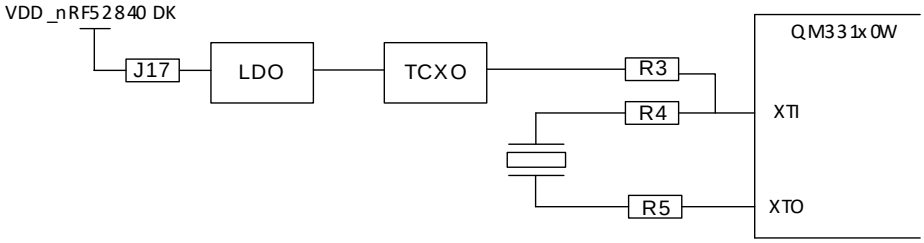

Figure 4 : QM331x0W Clock Tree

6 QM331x0W GPIOs

The following table lists the connections between the QM331x0W GPIOs and the nRF52840 GPIOs.

QM331x0W GPIO	nRF52840 GPIO
GPIO 0	P1.04
GPIO 1	P10.6
GPIO 2 / RXLED	P1.07
GPIO 3 / TXLED	P1.05
GPIO 4	P0.28
GPIO 5	P0.04
GPIO 6	P0.03
GPIO 7 / SYNC	P0.29
GPIO 8 / IRQ	P1.10

Table 4 : Correlation between QM331x0W GPIO and nRF52840 GPIO

7 QorvoOne GUI

The nRF52840 DK boards are shipped preprogrammed. So, you can connect the two nRF52840 DK boards to the PC using the supplied USB cable. Make sure that the antennas face each other during the evaluation.

Figure 5 : AoA System Evaluation Setup

Install QorvoOne GUI software included in QM33_QorvoOne_DK package and start the application.
The boards will be detected and displayed on the main screen.
For AoA evaluation, ensure that the QM33120WEVB (the one with the dual antenna) is configured as initiator.

Refer to the **QM33120WDK1 Quick Start Guide** for further information.

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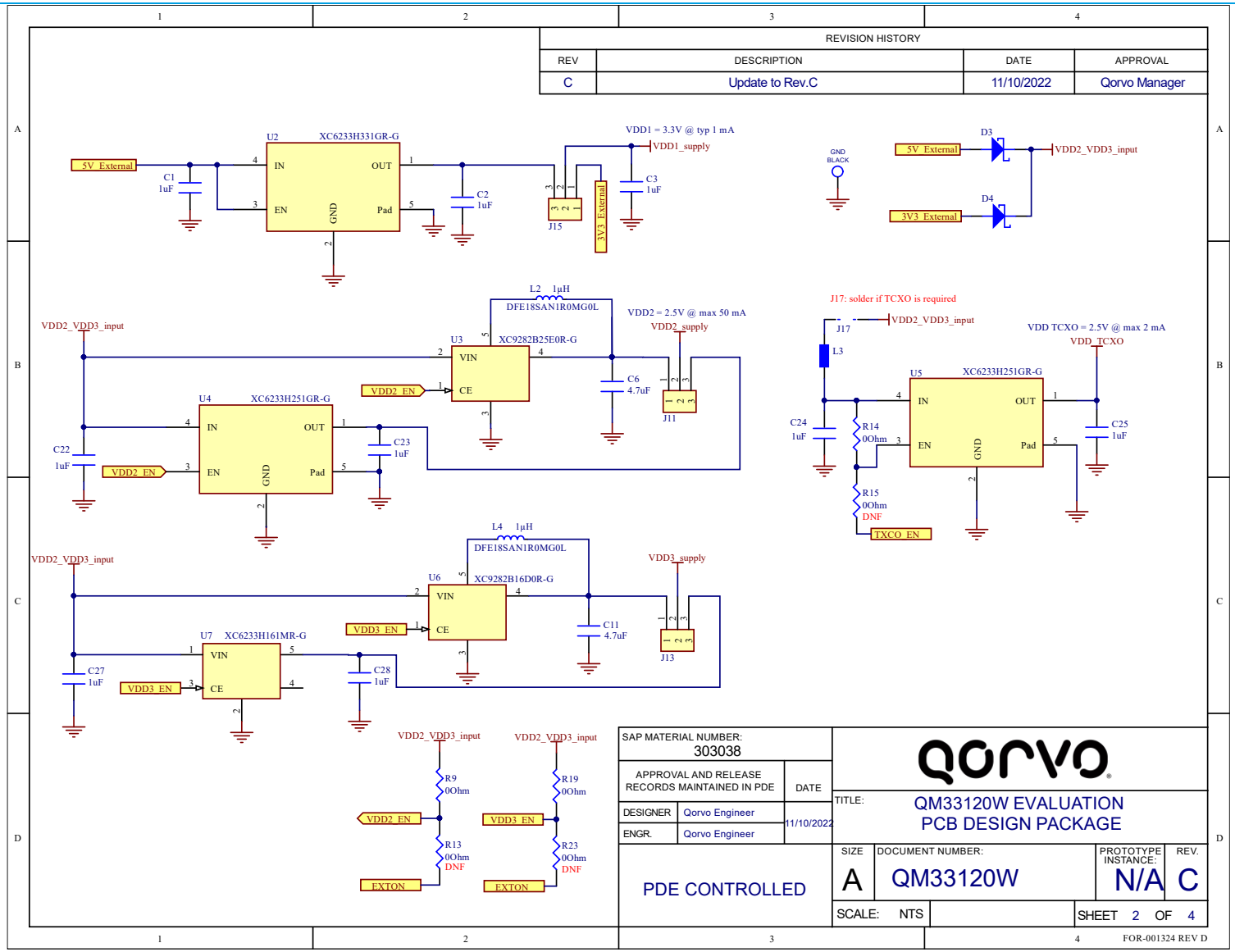
8 Schematic



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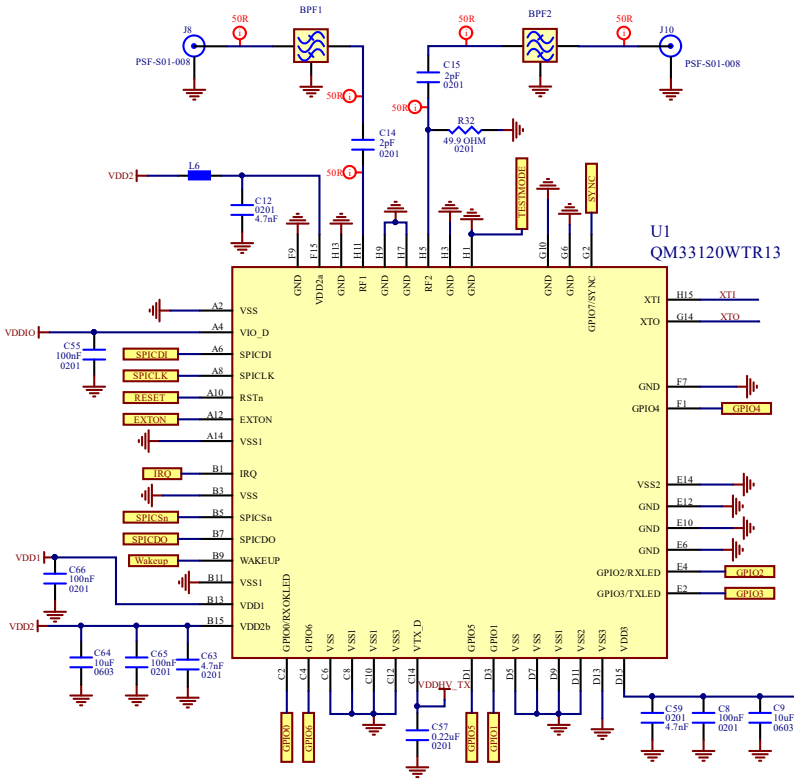
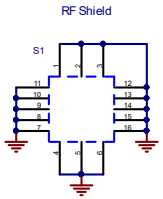
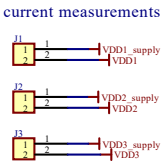
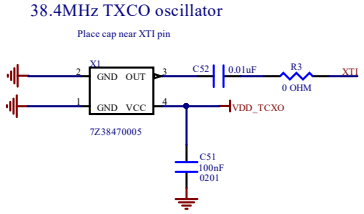
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVAL
C	Update to Rev.C	11/10/2022	Qorvo Manager



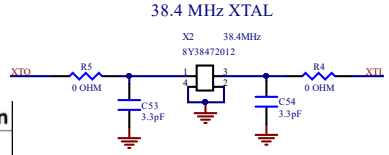
	AoA version	nonAoA version
U1	QM33120WTR13	QM33110WTR13
BPF2		DNF
C15		DNF
R32	DNF	
J10		DNF







	XTAL version	TCXO version
R3	DNF	
R4		DNF
R5		DNF



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APPROVAL AND RELEASE RECORDS MAINTAINED IN PDE		DATE	
DESIGNER	Qorvo Engineer	11/10/2022	
ENGR.	Qorvo Engineer		
PDE CONTROLLED			

TITLE: QM33120W EVALUATION PCB DESIGN PACKAGE

SIZE	DOCUMENT NUMBER:	PROTOTYPE INSTANCE:	REV.
B	QM33120W	N/A	C

SCALE: NTS SHEET 3 OF 4

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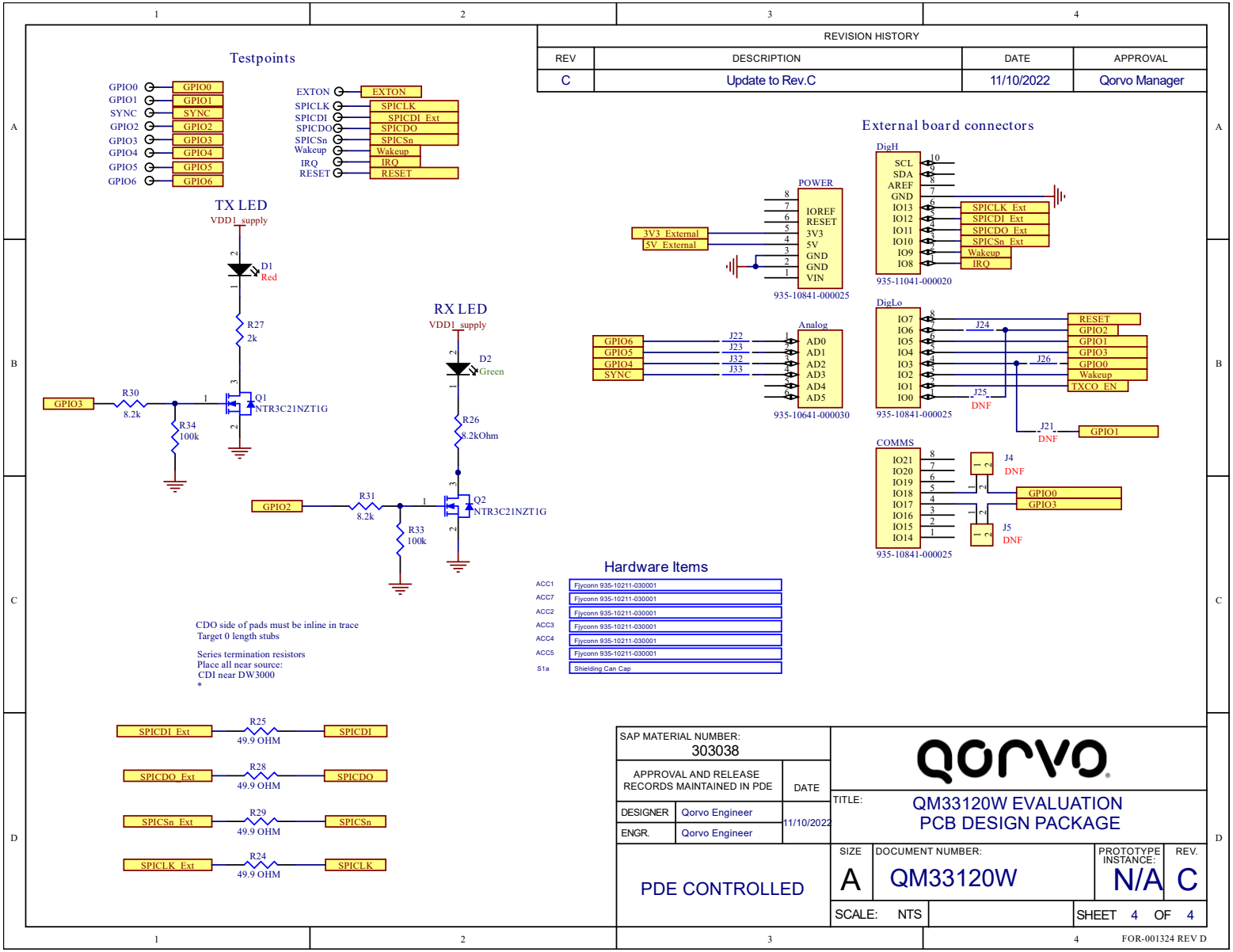

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Revision History

Revision	Date	Description
A	Jul 2022	Initial release
B	Nov 2022	Nordic board picture: correction of the description of the power switch Update of QM33120XDK1 schematic (from rev B to rev C)

Note: J-Link, J-Link OB, J-Flash Lite, Embedded Studio are registered trademarks of SEGGER Microcontroller GmbH.

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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