

R41Z-EVAL Kit Getting Started Guide

Contents

The R41Z Evaluation Kit from Rigado allows the stand-alone use of the R41Z module featuring the KW41Z NXP System on Chip.

This guide provides setup instructions for starting development.



Version 2.0

Contents

1	Overview	3
1.1	R41Z Module Key Features	3
2	Useful Tools.....	4
3	Hardware Kit.....	4
4	Verify R41Z is Connected to Your Computer	5
5	Set-up MCUXpresso.....	5
5.1	Download and Install MCUXpresso	5
5.2	Download and Install FRDM-KW41Z SDK	6
6	Example Project: Create a Beacon	8
6.1	Import the SDK Example Project	8
6.2	Programming the Evaluation Board.....	8
6.3	Testing the Program.....	10
6.4	Close the Project	10
7	Contact Information.....	11
	Appendix A – References.....	12
	Appendix B – Tables	12
	Appendix C – Figures.....	12
	Appendix D – Revision History	13

1 Overview

Rigado's R41Z, based on NXP's KW41Z, is an ultra-low-power, highly-integrated single-chip device that enables Thread with IEEE 802.15.4 and Bluetooth Low Energy (BLE) RF connectivity for portable, extremely low power embedded systems. With an ARM® Cortex®-M0+ CPU, integrated 2.4GHz transceiver, and an integrated antenna, the R41Z provides a complete RF solution allowing faster time to market with reduced development costs.

Providing full use of the NXP's KW41Z's capabilities and peripherals, the R41Z Series can power the most demanding applications, all while simplifying designs and reducing BOM costs. The R41Z is an ideal solution for designs that require concurrent communication on both an 802.15.4 based network such as Thread and a Bluetooth Low Energy network. This multi-mode capability enables participating in a mesh network for local and remote control/monitoring and direct communication using Bluetooth Low Energy via a mobile device.



Figure 1. R41Z Evaluation Board

1.1 R41Z Module Key Features

- Complete Thread (802.15.4) and Bluetooth Low Energy v4.2 solution
- Powerful & ultra-efficient 48MHz 32-bit ARM® Cortex™ M0+ CPU with 512kB Flash & 128kB SRAM
- Secure Bootloader (encrypted over-the-air updates)
- Transmitter certifications: FCC (USA), IC (Canada), MIC (Japan)
- Transmitter compliance: CE (Europe), RCM (Australia / New Zealand)
- Bluetooth & Thread certifications: (pending)

2 Useful Tools

Below is a list of tools that aid in development with the R41Z modules.

Tool	Description
Kinetis BLE Toolbox App (iPhone Android)	A NXP mobile app used to test BLE demo applications for the KW41Z
MCUXpresso SDK	Example code and documentation
MCUXpresso IDE	A free IDE for embedded development
NXP's Bluetooth Low Energy Documentation	Guides and reference material for BLE (also available in the SDK)
Segger J-Link Software	Software and documentation pack for the Segger J-Link interface

Table 1. Useful Tools for R41Z

3 Hardware Kit

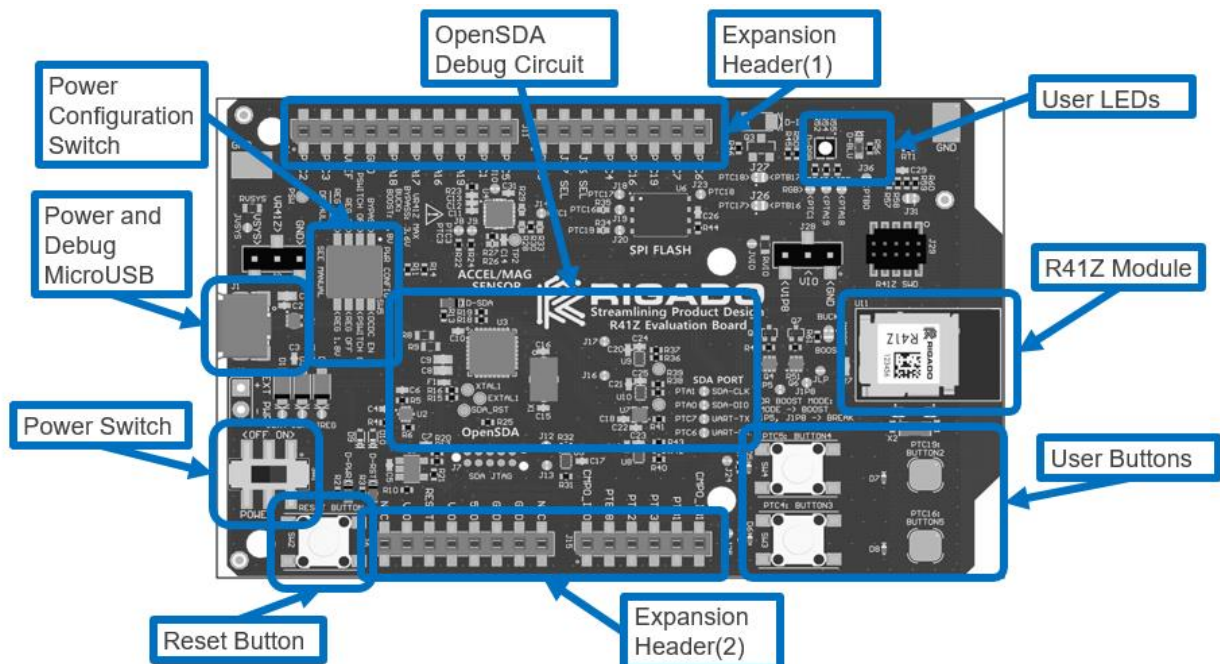


Figure 2. R41Z Evaluation Board Overview (top view)

- 1x R41Z Evaluation Board
- 1x Micro-USB Cable

4 Verify R41Z is Connected to Your Computer

1. Connect the USB cable
2. Both the RGB and Blue User LEDs should be blinking
3. Open your Device Manager, it should resemble figure 3

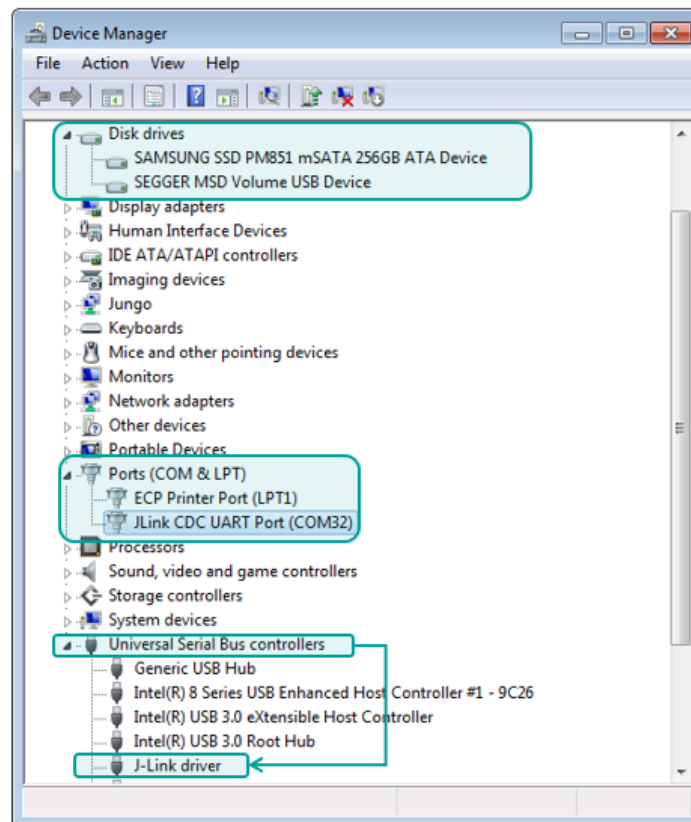


Figure 3. Device Manager with R41Z-EVAL Connected

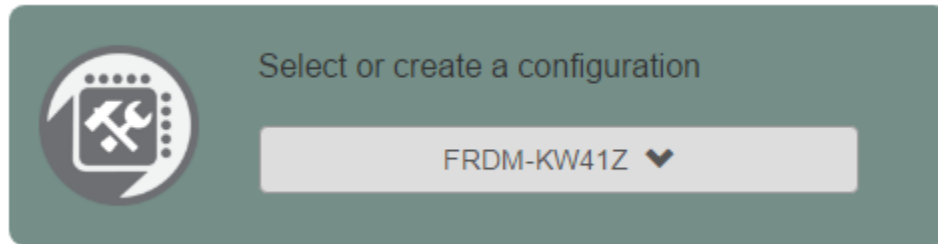
5 Set-up MCUXpresso

5.1 Download and Install MCUXpresso

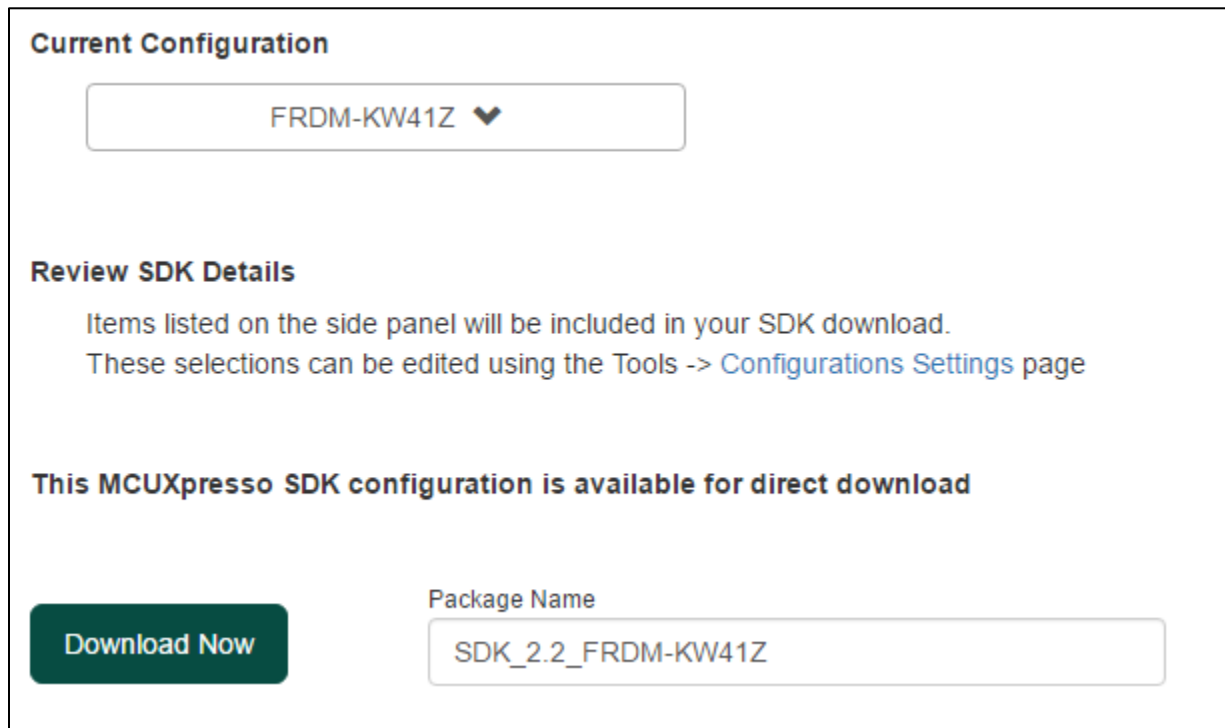
1. Navigate to www.nxp.com/mcuxpresso/ide
2. Click download
3. Sign in or register
4. Accept the Software Terms and Conditions
5. Select and download the appropriate OS version
6. Run the Installation program with default configurations

5.2 Download and Install FRDM-KW41Z SDK

1. Navigate to mcuxpresso.nxp.com
2. Log in to an NXP account, if necessary
3. Select FRDM-KW41Z under “select or create a configuration”



4. Click “SDK Builder”
5. Select “Download Now”. If this option is not available, update your profile preferences and try again



6. Accept the Software Terms and Conditions
7. The SDK should automatically download
8. Start MCUXpresso IDE

9. Create a workspace. The example here runs on a Microsoft Windows system with the workspace located off the C drive:

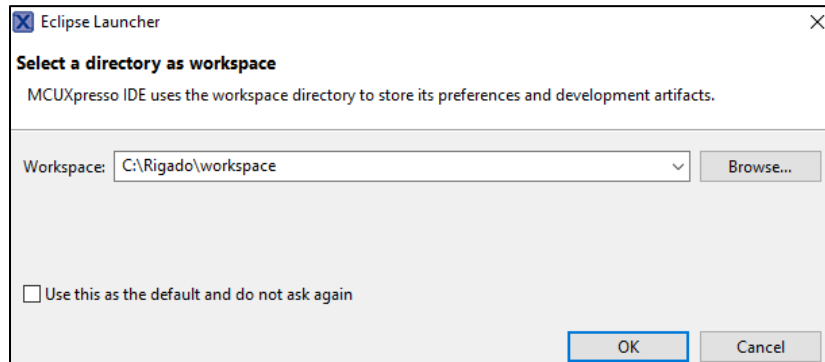


Figure 4. Workspace Launcher

10. In the workspace, press Alt+Shift+Q then Q to open the Show View Settings
11. Select MCUXpresso IDE > Installed SDKs and hit OK

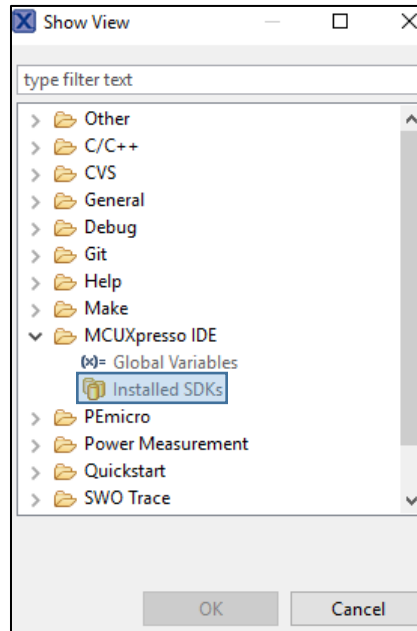


Figure 5. Show View Configuration

12. The “Installed SDKs” tab should appear in the bottom section of the program

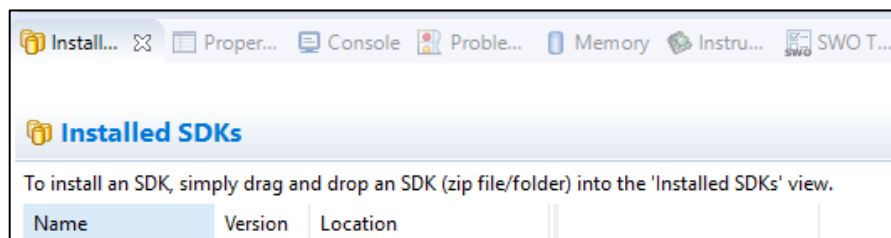


Figure 6. Installed SDKs Tab

13. Drag and drop the SDK downloaded in step 6 into the “Installed SDKs” view
14. If prompted, click “OK” to import the SDK

15. Once the installation is complete, the SDK should be visible in the view

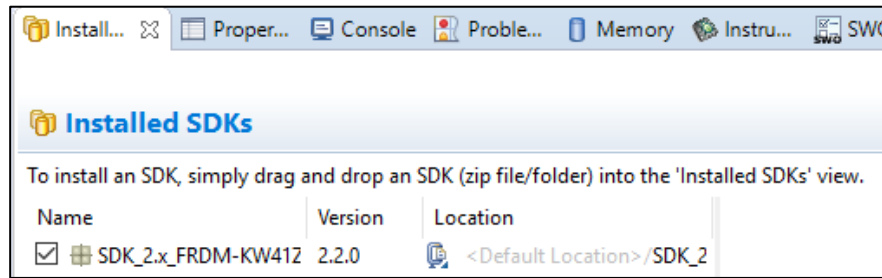


Figure 7. FRDM-KW41Z SDK Selected

16. Click the  (recreate and reload part support info) button

6 Example Project: Create a Beacon

This is an example of how to program the R41Z Evaluation Board using MCUXpresso. This procedure clones a stand-alone version of the example.

6.1 Import the SDK Example Project

1. Under the Quickstart Panel, select Import SDK example(s)...
2. In the new window, select the frdmkw41z board from the Available Boards panel and click next
3. Select wireless_examples>Bluetooth>beacon> freertos

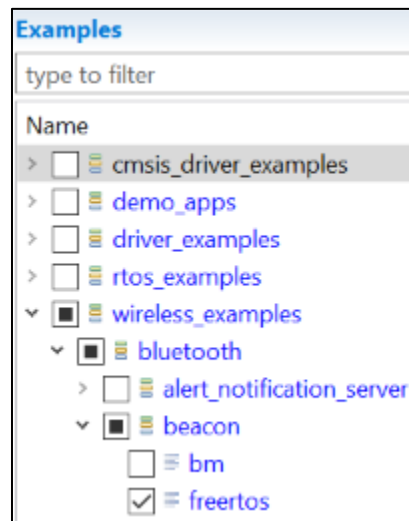


Figure 8. Select Beacon Example for Importing

4. Click Finish to import the project into your workspace

6.2 Programming the Evaluation Board

1. Open the file frdmkw41z_wireless_examples_bluetooth_beacon_freertos > source > app_preinclude.h from the Project Explorer
2. Navigate to line 108

3. Modify the advertising address with the Rigado-assigned MAC address. The first half of all Rigado MAC addresses begin with (0x)945493. The second half is printed on the label, as noted in section x.x of the R41Z datasheet. For example if the label were printed with 010203, then the complete MAC address is 945492010203. Line 104 then becomes:

```
#define BD_ADDR          0x94, 0x54, 0x93, 0x01, 0x02, 0x03
```
4. Select the project folder from the Project Explorer and click the  (build) button
5. Wait for the build to finish
6. Click the  (debug) button
7. You may be prompted to accept changes to your computer for P&E and LinkServer. These are not required. Rigado uses and recommends J-Link
8. If prompted, select J-Link OpenSDA from the probe menu and click OK

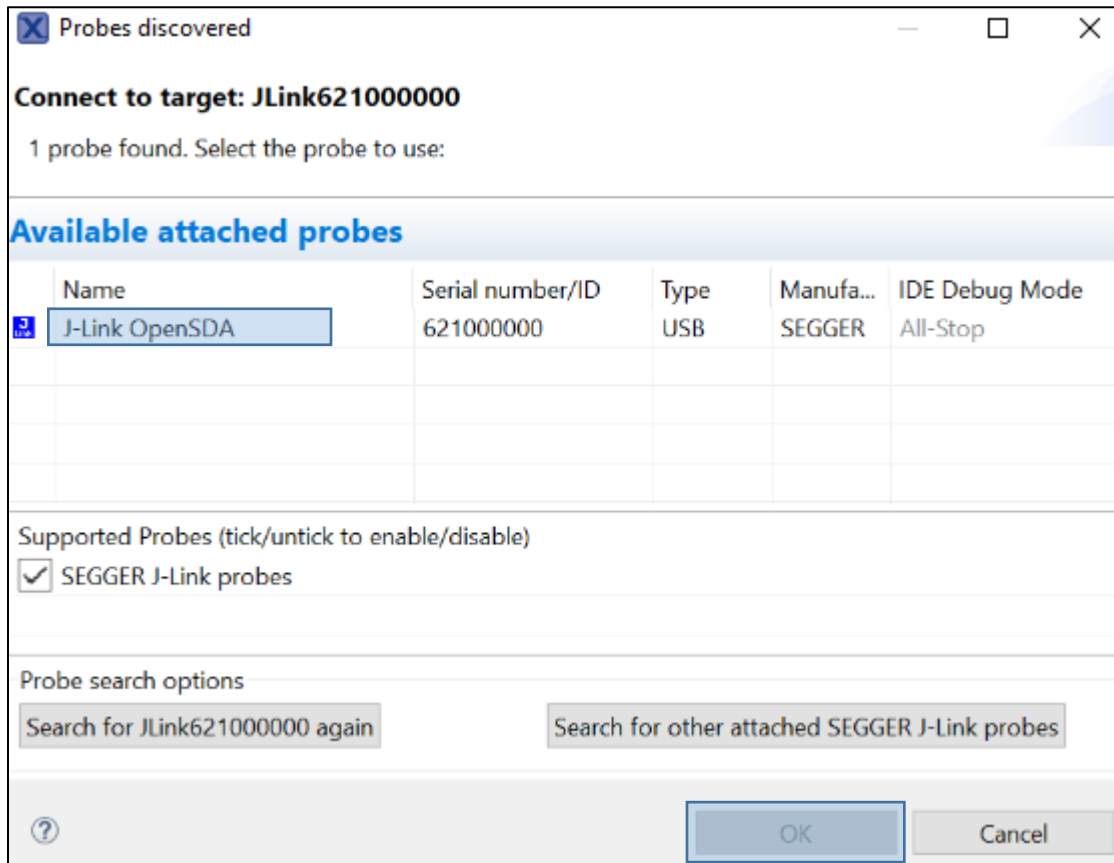


Figure 9. Probes Discovered

9. Wait for the device to be programmed
10. If not already there, switch to the debug view
11. Run the program using the  (resume) button
12. The Blue User LED should start blinking

6.3 Testing the Program

1. Open the Kinetis BLE Toolbox App on your Android or iPhone
2. Tap the Beacons icon in the top left corner *(Note: If using a project that is not Beacon-based, start Advertisement by pressing one of the user buttons on the evaluation board.)*
3. Select the beacon with your Manufacturer ID *(Note: The Manufacturer ID is listed in big-endian location, while in the code the Manufacturer ID was listed little-endian.)*
4. Customize your Beacon Message by selecting the current message, altering the message, and tapping the check mark in the upper right corner



Figure 10. Beacon Example Message

5. This message will only appear when the app receives your Beacon Advertisement. *(Note: This message is kept in the app. Other users will not see the changed message.)*

6.4 Close the Project

1. Return to MCUxpresso and terminate the debug session by clicking the  (terminate) icon
2. Right click on the main project folder and select Close Project

7 Contact Information

Headquarters

Rigado LLC
3950 Fairview Industrial Dr SE
Suite 100
Salem, Oregon 97302
866-6-RIGADO • info@rigado.com

Portland Branch

Rigado LLC
101 SW Main Street
Suite 2000
Portland, Oregon 97204
866-6-RIGADO • info@rigado.com

Sales Network

Please visit the Partners page of our [Rigado Website](#) for the contact details of our distributor(s) and sales representative(s) in your region.

Appendix A – References

Item	Description / Link
Rigado Documents	http://rigado.com/support

Table 2. References

Appendix B – Tables

Table 1. Useful Tools for R41Z	4
Table 2. References	12
Table 3. Revision History.....	13

Appendix C – Figures

Figure 1. R41Z Evaluation Board	3
Figure 2. R41Z Evaluation Board Overview (top view)	4
Figure 3. Device Manager with R41Z-EVAL Connected	5
Figure 4. Workspace Launcher.....	7
Figure 5. Show View Configuration	7
Figure 6. Installed SDKs Tab	7
Figure 7. FRDM-KW41Z SDK Selected.....	8
Figure 8. Select Beacon Example for Importing.....	8
Figure 9. Probes Discovered	9
Figure 10. Beacon Example Message.....	10

Appendix D – Revision History

Revision	Changes	Date
1.0	Initial Release	2017-04-19
2.0	Updated to use MCUxpresso instead of KDS	2017-08-16

Table 3. Revision History