

MKW40Z Bluetooth[®] Low Energy Quick Start Guide

1 Introduction

This document is a brief presentation of the Freescale Bluetooth[®] Low Energy Software for the KW40Z wireless microcontroller platforms version 1.1.3. This software package is an add-on for the Kinetis Software Development Kit (KSDK). This document covers installation of the software packages, hardware setup, build and usage of the provided demo applications.

2 Installation

This section covers the steps for a successful installation of the required software packages: connectivity and Kinetis SDK.

Contents

1	Introduction1
2	Installation1
3	Building the Binaries 6
	3.1 Building the KSDK Libraries
	3.2 Building and Flashing the Freescale BLE Software Demo Applications
4	Hardware Configurations11
	4.1 Freescale Freedom FRDM-KW40 Platform Introduction
5	Revision history12





The first step is to download the "KW40Z_Connectivity_Software_1.0.0.exe" installer.

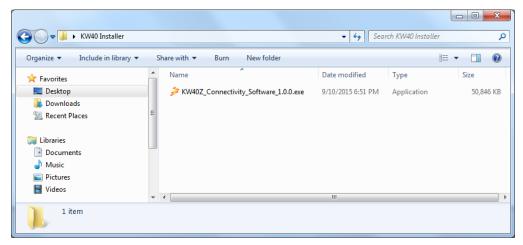


Figure 1: The KW40Z Connectivity Software Installer

On the main screen, press the Next button.



Figure 2: KW40Z Installer main screen



On the *License Agreement* screen press the *I agree* button to accept the license agreement.

KW40Z Connectivity Software 1.0.0 Setup							
License Agreement Please review the license terms before installing KW40Z Connectivity Software 1.0.0.							
Press Page Down to see the rest of the agreement.							
A_OPT_FSL_OPEN_3RD_PARTY_IP v6 February 2015 IMPORTANT. Read the following Freescale Semiconductor Software License Agreement ("Agreement") completely. By selecting the "I Accept" button at the end of this page, you indicate that you accept the terms of the Agreement and you acknowledge that you have the authority, for yourself or on behalf of your company, to bind your company to these terms. You may then download or install the file.							
FREESCALE SEMICONDUCTOR SOFTWARE LICENSE AGREEMENT This is a legal agreement between you, as an authorized representative of your employer, or if you have no employer, as an individual (together "you"), and Freescale Semiconductor, Inc. ("Freescale") and its Affiliates. It concerns your rights to use the							
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install KW40Z Connectivity Software 1.0.0.							
< Back I Agree Cancel							

Figure 3: License agreement screen

On the next screen click *Browse* to select another destination folder for the KW40Z Connectivity Software installation or click the *Next* button to continue.

KW40Z Connectivity Software 1.0.0 Setup			- • ×
Choose Install Location Choose the folder in which to install KW40Z Con Software 1.0.0.	nnectivity	🏓 fr	eescale
Setup will install KW40Z Connectivity Software different folder, dick Browse and select anothe			install in a
Destination Folder C:\Freescale\KW40Z_Connectivity_Softwa	ire_1.0.0	Bro	wse
Space required: 273.4MB Space available: 30.2GB			
	< <u>B</u> ack	Next >	Cancel

Figure 4: Destination folder selection screen



On the following screen uncheck the first two options and press the Next button.

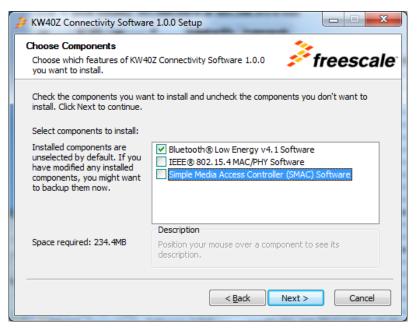


Figure 5: Component selection screen

Select a Start Menu folder and press the Install button.

KW40Z Connectivity Software 1.0.0 Setup		
Choose Start Menu Folder Choose a Start Menu folder for the KW40Z Cor 1.0.0 shortcuts.	nnectivity Software	<i>Freescale</i>
Select the Start Menu folder in which you would can also enter a name to create a new folder.	d like to create the p	orogram's shortcuts. You
KW402 Connectivity Software 1.0.0		
Accessories		
AccuRev		
Administrative Tools		
Adobe		
Atlassian		
Beyond Compare 4		
Courion Corporation		
FreeMat		
Freescale BeeKit		_
Freescale CodeWarrior		•
Do not create shortcuts		

Figure 6: KW40Z installer Start Menu Folder selection screen

MKW40Z Bluetooth® Low Energy Quick Start Guide, Rev. 0, 9/2015



istalling Please wait while KW40Z Connectivity So installed.	ftware 1.0.0 is being	🚀 freesc	a
Extract: org.eclipse.cdt.managedbuilder.	core.prefs 100%		_
Extract: dean.sh 100% Output folder: C:\Freescale\KW40Z_Co Output folder: C:\Freescale\KW40Z_Co Extract: .cproject 100% Extract: .project 100% Output folder: C:\Freescale\KW40Z_Co Extract: com.atollic.truestudio.debug.h Extract: com.atollic.truestudio.import.e Extract: language.settings.xml 100% Extract: org.eclipse.cdt.managedbuilde	onnectivity_Software_1.0 onnectivity_Software_1.0 wardware_device.prefs wample.prefs 100%	.0\\KSDK_1.3.0\\ib\k	•

Figure 7: KW40Z installation process

Click Finish to close the installer.

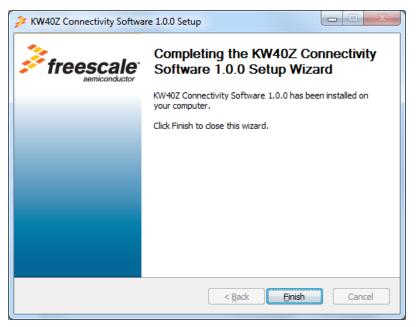


Figure 8: KW40Z Connectivity Software installation complete

The installer automatically creates or updates the $KSDK_1_3_0_PATH$ environment variable required by the KW40Z BLE projects. Once the above steps are performed, you can start using the Bluetooth[®] Low Energy Demo Applications.



3 Building the Binaries

This section details the required steps for obtaining the binary files for usage with the boards.

NOTE

In order to be able to build any of these packages you need a copy of the IAR Embedded Workbench for ARM[®] version 7.40.2 or higher. This connectivity software package does not include support for any other toolchains.

The packages must be built with the debug configuration in order to enable debugging information.

Building the KSDK Libraries

This release supports all development platforms based on the KW40Z wireless microcontroller. The RTOS support includes the FreeRTOS kernel, and a bare metal scheduler. The KSDK platform libraries are RTOS dependent, so appropriate libraries must be built for the selected RTOS.

For any connectivity application, the following Kinetis SDK libraries must be built with the IAR Embedded Workbench for ARM[®] in order to enable the complete board support and RTOS kernel support:

• FreeRTOS or bare metal Platform drivers library

The location of the KSDK platform projects is described using the following placeholders for text:

- <ksdk_path> : represents the root path of the KSDK installation folder
- <device> : represents the board MCU: KW40Z4
- <board> : represents the board: frdmkw40z

Using the placeholders, these are the required Kinetis SDK v1.3.0 projects locations:

- <ksdk_path>\lib\ksdk_freertos_lib\iar\<device>\ksdk_freertos_lib.eww
- <ksdk_path>\lib\ksdk_platform_lib\iar\<device>\ksdk_platform_lib.eww

NOTE

The IAR projects for KSDK libraries are included in the IAR workspaces corresponding to the BLE demonstration applications and it is recommended to access them this way.

Building and Flashing the Freescale BLE Software Demo Applications

The package contains various demo applications that can be used to get a first feel for the software.

In this section you will be guided through building the Heart Rate Sensor demo application, using the following placeholders for text.

For brevity we shall introduce the following placeholders for text:

• <connectivity_path> : represents the root path for the Freescale BLE software package



- <board> : represents the target board for the demo app, for example "frdmkw40z"
- <demo_app> : represents the demo app name
- <RTOS> : represents the Real Time Operating System (FreeRTOS) or bare-metal scheduler

The demo applications general folder structure is the following:

<connectivity_path>\examples\bluetooth\<demo_app>\<board>\<RTOS>\build\iar

Freescale BLE Software Demo Application Build Example

Selected app: Heart Rate Sensor Board: frdmkw40z RTOS: bare-metal scheduler Resulting location: <connectivity_path>\examples\bluetooth\heart_rate_sensor\frdmkw40z\bare-metal\build\iar\

Step 1:

Navigate to the resulting location.

Step 2:

Open the highlighted IAR workspace file (*.eww file format):

Organize 🔻 🛛 Include i	n library 🕶 Share with 🕶 Burn New	folder			8≡ ▼	
숨 Favorites	Name	Date modified	Туре	Size		
	heart_rate_sensor.ewd	9/4/2015 4:29 PM	EWD File	73 KB		
词 Libraries	heart_rate_sensor.ewp	9/11/2015 1:23 PM	EWP File	75 KB		
	heart_rate_sensor	9/4/2015 4:29 PM	IAR IDE Workspace	1 KB		
🖳 Computer						
• ••••						
👊 Network						

Figure 9: Heart Rate Sensor Demo Application - Project Location

Step 3:

Select the KSDK platform (bare-metal) library project.



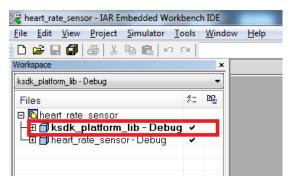


Figure 10: IAR project for KSDK platform (bare-metal) library

Step 4:

Build the KSDK platform library project.

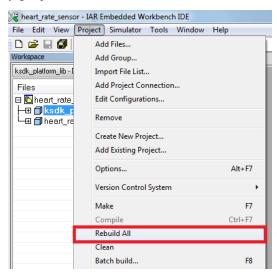


Figure 11: KSDK platform library build

Step 5:

Select the Heart Rate Sensor project.

File Edit View Project CMSIS-DAP	Tools	Windo	w He
D 📂 🖬 🗊 🎒 👗 🖻 🛍 🗠			
Workspace		×	
heart_rate_sensor - Debug			
Files	2	۲.	
🗆 ြ heart_rate_sensor			
– ⊞ 🗇 ksdk platform lib - Debug	~		
-🕀 🗇 heart_rate_sensor - Deb.	🖌		

Figure 12: IAR project for Heart Rate Sensor with bare-metal scheduler



Step 6:

Build the Heart Rate Sensor project.

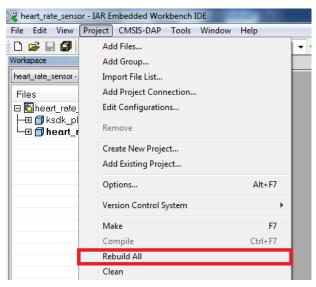


Figure 13: Heart Rate build

Step 7:

Make the appropriate debugger settings in the project options window:

Options for node "heart_rate_sensor"					
Category: General Options Static Analysis Runtime Checking C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator Angel CMSIS DAP GDB Server IAR ROM-monitor	Factory Settings Factory Settings Setup Download Images Extra Options Multicore Plugins Driver Image Bun to CMSIS DAP main Setup macros Image macro file(s) Devige description file Image macro file(s)				
IAR ROM-monitor I-jet/JTAGjet J-Link/J-Trace TI Stellaris Macraigor	Devige description file Qvenide default STOOLKIT_DIRS\CONFIG\debugger\Freescale\MKW40Z160				
PE micro RDI ST-LINK Third-Party Driver					
TI XDS	OK Cancel				

Figure 14: Debugger Settings



Step 8:

Click the "Download and Debug" button to flash the executable onto the board.

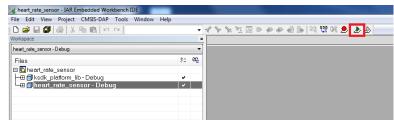


Figure 15: Heart Rate Sensor Download and Debug

NOTE

The projects are configured with "CMSIS-DAP" firmware as the default debug configuration. Please make sure that your board's OpenSDA chip contains a CMSIS-DAP firmware or that the debugger selection corresponds to the physical interface used to connect to the boards. See the section below for more information.



4 Hardware Configurations

This section describes how to set up the Freescale Freedom FRDM-KW40 platform for the Bluetooth[®] Low Energy applications.

Freescale Freedom FRDM-KW40 Platform Introduction

4.1.1 Freescale Freedom FRDM-KW40 Platform Features

The target platform is the FRDM-KW40 board based on the KW40 wireless, dual mode SoC, which incorporates an ARM[®] Cortex[®]-M0+ core configured to operate at 32 MHz frequency. It has 160 KB of Flash and 20 KB of RAM. For detailed information about the board, see the appropriate board user's guide.

The board features a composite USB device called OpenSDA which serves as debugger interface and as a USB-to-serial converter via a virtual COM port application. Several firmware images can be programmed on the OpenSDA device, such as these:

- developer.mbed.org/handbook/CMSIS-DAP
- <u>segger.com/opensda.html</u>
- <u>www.pemicro.com/opensda/</u>

4.1.2 Freescale Freedom FRDM-KW40 Platform Overview



Figure 16: Freescale Freedom FRDM-KW40 platform



5 Revision history

This table summarizes revisions to this document.

Revision History				
Revision number	Date	Substantial changes		
0	09/2015	Initial release		

MKW40Z Bluetooth® Low Energy Quick Start Guide, Rev. 0, 9/2015



Information in this document is provided solely to enable system and software implementers to use Freescale products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document.

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including "typicals," must be validated for each customer application by customer's technical experts. Freescale does not convey any license under its patent rights nor the rights of others. Freescale sells products pursuant to standard terms and conditions of sale, which can be found at the following address: freescale.com/SalesTermsandConditions.

Freescale, the Freescale logo, and Kinetis are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. All other product or service names are the property of their respective owners. ARM, ARM powered logo, and Cortex are registered trademarks of ARM Limited (or its subsidiaries) in the EU and/or elsewhere. All rights reserved. © 2015 Freescale Semiconductor, Inc.

How to Reach Us:

Home Page: freescale.com

Web Support: freescale.com/support



