

FRDM-KE02Z Sample Code Guide for KEIL MDK

User Guide

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1 Introduction

This sample code guide will provide information about the FRDM-KE02Z board and development tools, and explains the features of the FRDM-KE02Z board, the features of the OpenSDA standard, and how to access the source code examples using KEIL uVision MDK. This guide will also provide instructions for how to download a precompiled binary file to your board.

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2 FRDM-KE02Z features

The Freedom board (FRDM-KE02Z) features the Kinetis KE02Z64VQH2 microcontroller and comes with the following features (which are highlighted in the figure below):

- Tri-color LED
- 10Mhz crystal
- MMA8451Q Inertial Sensor
- OpenSDA connection



OpenSDA overview

- Mini-B USB connector
- Touch Pad (Slider)
- IrDA (infrared)
- Thermistor

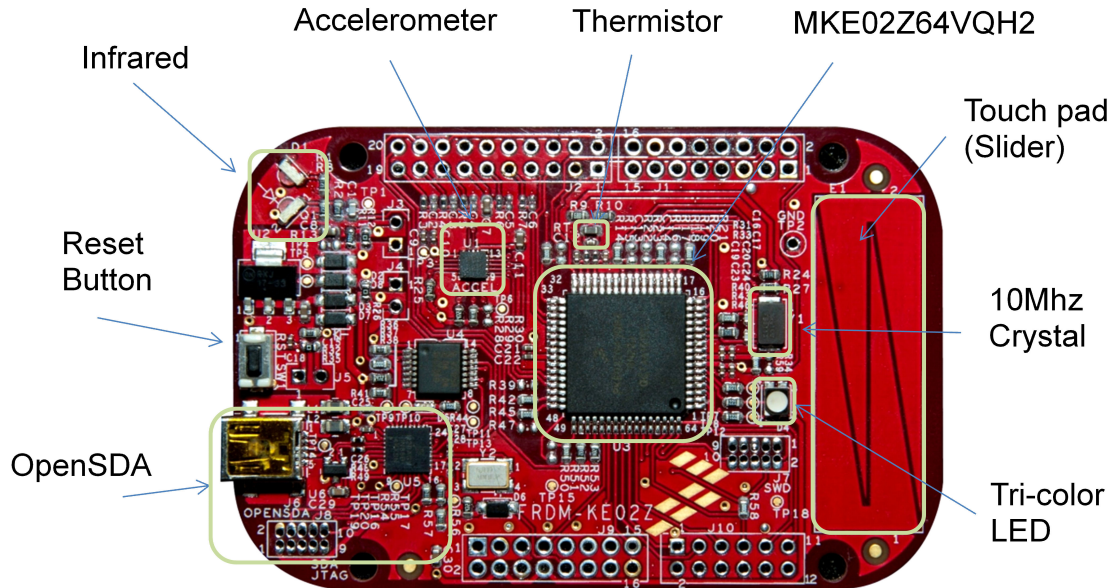


Figure 1. FRDM-KE02Z

3 OpenSDA overview

OpenSDA is an open-standard serial and debug adapter. It bridges serial and debug communications between a USB host and an embedded target processor. OpenSDA features a mass storage device boot loader, which offers a quick and easy mechanism for loading applications such as flash programmers, run-control debug interfaces, serial-to-USB converters, and more, onto your Freedom board. Currently, P&E Micro offers two different applications: an MSD application and a debug application.

3.1 MSD application

This OpenSDA application was developed by P&E Micro, and allows the Freedom board to instantiate as a mass storage device on your computer. Once this application is properly numbered, the KE02Z64 on the Freedom board can be programmed with a binary or SREC file by simply "dragging and dropping" one of these files into the FRDM-KE02Z drive that is installed when your Freedom board is enumerated. In addition, serial communication with the KE02Z64 will also be available.

3.2 Debug application

This OpenSDA application was also developed by P&E Micro, and allows programming and debugging the KE02Z64 on the Freedom board in a way similar to what any other debugger module would allow.

With this application loaded onto the Freedom board, serial communication with the KE02Z64 will be available.

4 Downloading and installing software and tools

4.1 Downloading and installing OpenSDA drivers

Before beginning, you will need the latest OpenSDA serial drivers installed on the development computer and on FRDM-KE02Z. The latest OpenSDA drivers should already be installed on the FRDM-KE02Z, and the system should be able to automatically find the latest Windows CDC drivers (as they should be pre-installed on the Freedom board). In the case they are not, please refer to the OpenSDA user's guide which can be found in your Quick Start Package.

4.2 Downloading and installing KEIL MDK 4.72 and Tools

4.2.1 Downloading and installing EIL MDK 4.72

To download the KEIL MDK 4.72 (or later), follow these instructions:

1. Navigate to the MDK-ARM Freescale Edition download page by opening an internet browser and typing www.keil.com/freescale/ into the web browser's address bar. Then, click the MDK-Freescale link at the bottom of the page.
2. At the MDK-ARM Freescale Edition page, click the Download button from the right-hand side of the page.
3. Follow ARM's downloading and licensing instructions.
4. To install software tools, follow the installer package instructions once the download is complete.

4.2.2 Downloading and installing the OpenSDA patch for KEIL MDK

To download and install the OpenSDA patch for the KEIL MDK 4.72, follow these instructions:

1. Navigate to the Freescale Kinetis OSJTAG Drivers V1.12 download page by opening an internet browser and typing www.keil.com/download/docs/408.asp into the web browser's address bar.
2. At the Freescale Kinetis OSJTAG Drivers V1.12 download page, click the FSLKINETISDRIVERSV112.EXE link and follow the onscreen instructions for saving this file to the computer.
3. Next, navigate to the location of the saved file, double click the executable, and follow the onscreen instructions for installing these files.
4. Navigate to the keil_pemicro_plugin_v1.13 zip download page by opening following link: http://www.pemicro.com/fixedlinks/keil_pemicro_plugin_v1.13.zip.
5. Unzip the keil_pemicro_plugin_v1.13 zip, copy the pemicro folder, and paste it into .\keil\arm\ directory.

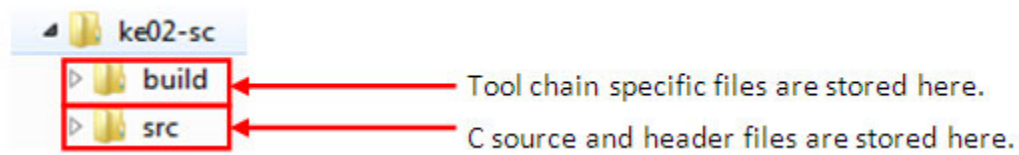
5 Freescale sample code

The Freescale sample code for KE02 is baremetal code.

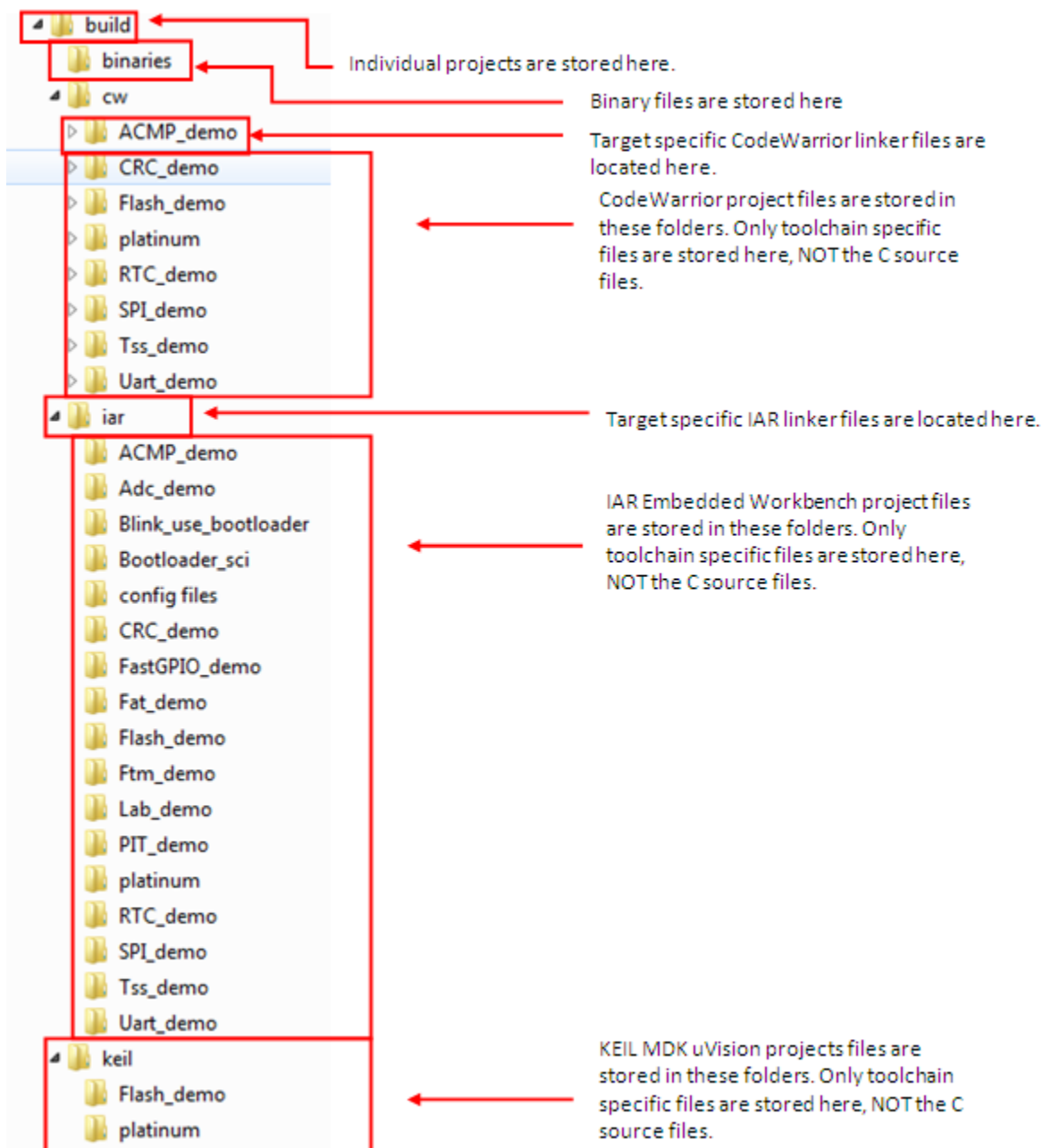
5.1 Baremetal sample code (ke02-sc)

5.1.1 Baremetal sample code folder structure

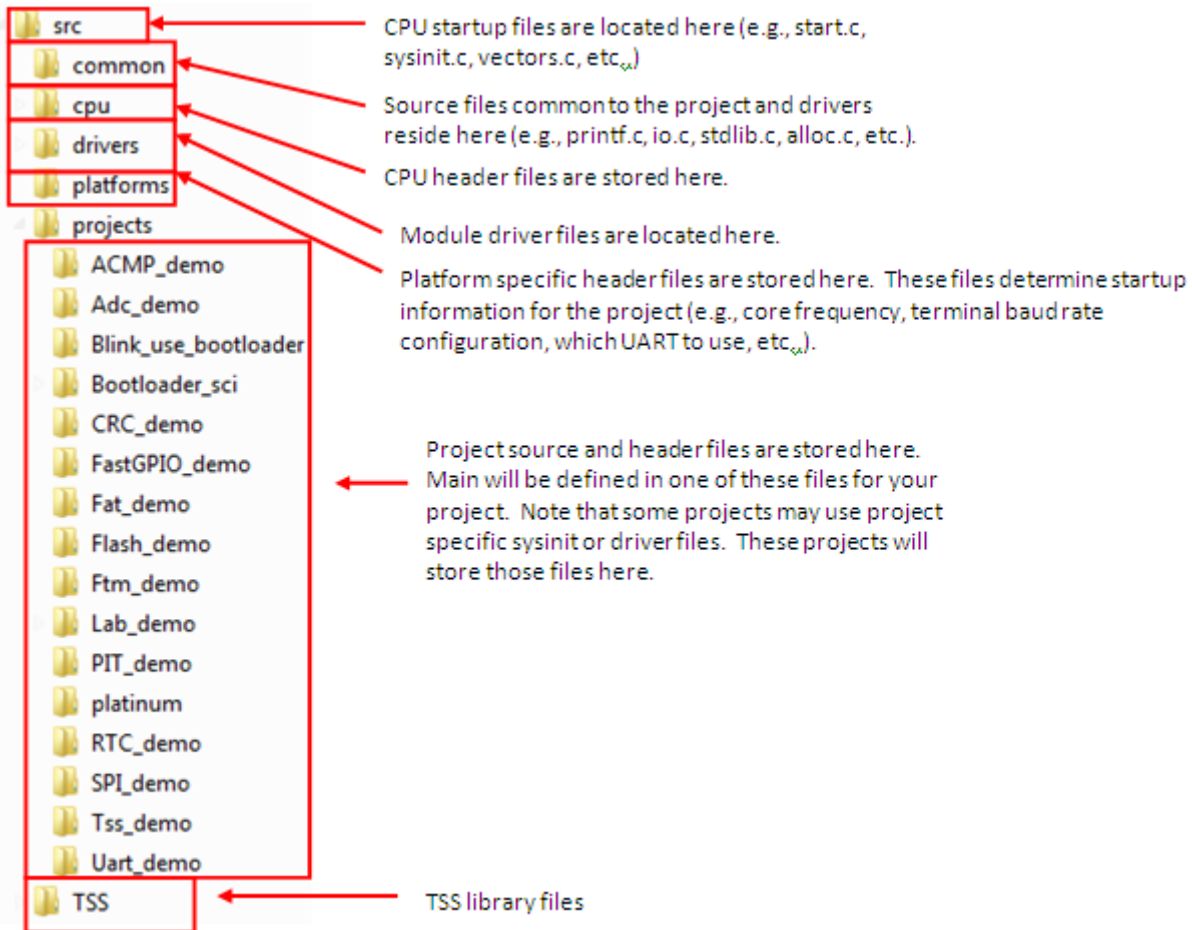
The baremetal sample code folder contains two folders at the top level: a build folder and an src (source) folder.



First is the build folder, shown in the following image:

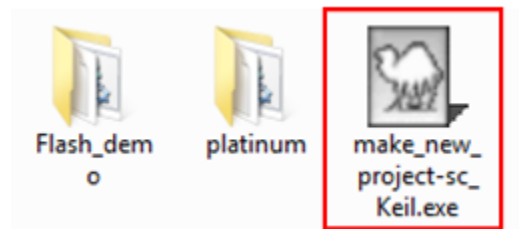


Then source folder structure, shown in the following:



5.1.2 Using the freescale baremetal sample code to jumpstart the design

The Kinetis E Family sample code is provided as a jump start for your design, as well as providing code examples. To facilitate this, a script that copies the platinum project and renames it to the desired project name is provided. This script is a single executable that resides in the ke02-sc\build\keil folder.



Simply double click this icon and a command prompt pop-up window will prompt you for a project name. Copy the platinum project and rename all of the necessary files in order for the new project to work correctly.

6 Configuring hardware

1. Using a Mini-B to A USB cable, connect the FRDM-KE02Z board to the development computer. Be sure to plug the Mini-B connection into the OpenSDA port of the FRDM-KE02Z board.
2. No special hardware configuration is necessary to run the demo applications in the code examples unless otherwise specified by the "readme.txt" file located in the project folder.

7 Terminal program configuration

The OpenSDA serial port is designed to calculate just as any other USB-to-serial converter. Open a serial terminal utility (Tera Term, Hyperterm, etc.) and configure the terminal as follows:

- 9600 baud
- 8-data-bits
- no parity
- no flow control

8 Loading and running the demos in KEIL MDK 4.72

The following instructions describe how to build and flash the helloworld demo using CodeWarrior. This document is targeted for users who choose to use the OpenSDA programming and debugging capabilities, assuming that you have loaded the P&E Micro Debug application onto your FRDM-KE02Z. If you need assistance in loading this application onto the FRDM-KE02Z, please refer to the OpenSDA user's guide provided in your Quick Start Package.

1. Open KEIL uVision4 (Start->All Programs->KEIL uVision4).
2. Open the workspace at ..\ ke02-sc\build\keil\platinum\ platinum.uvmpw. This can be done by either dragging the platinum.uvproj icon into the KEIL Workspace, or by selecting Project->Open Project... and pointing KEIL to the project path through the dialog box that pops up.
3. Compile the project by clicking the Build icon:



or the Rebuild icon:



(or right clicking on the project and select "Build" or "Rebuild").

4. After compilation completes, download the code to the board and start the debugger by pressing the "Start/Stop Debug Session" button.

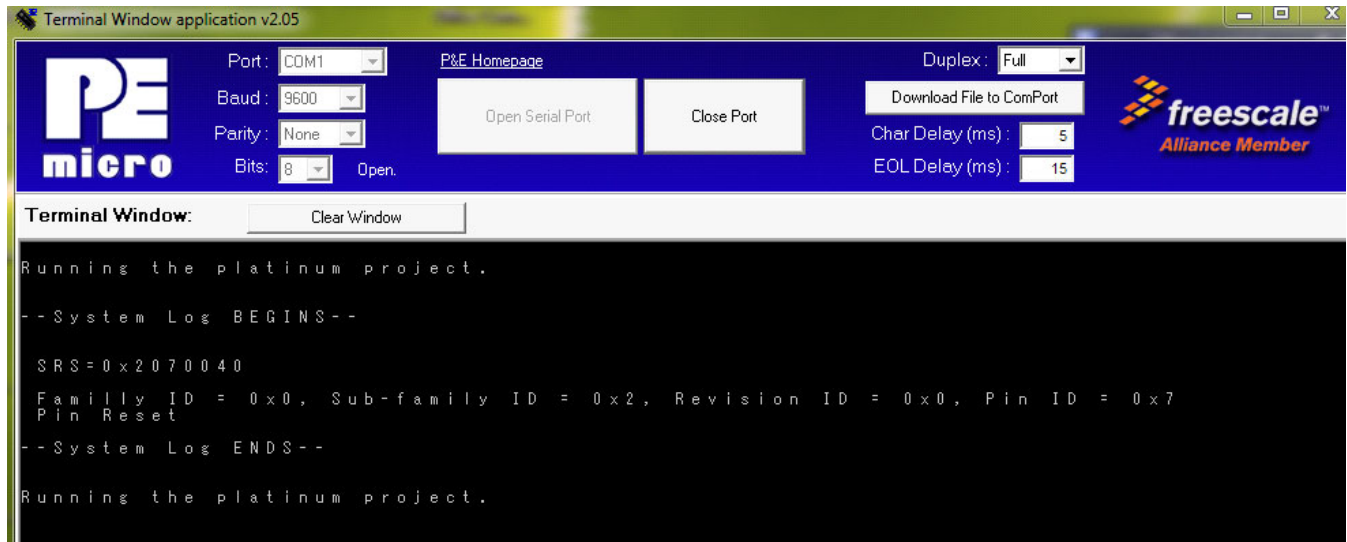


Flashing the precompiled binary onto your board

5. The code will download, and the debugger screen will show up and pause at the first instruction. Hit the "Run" button to start running.



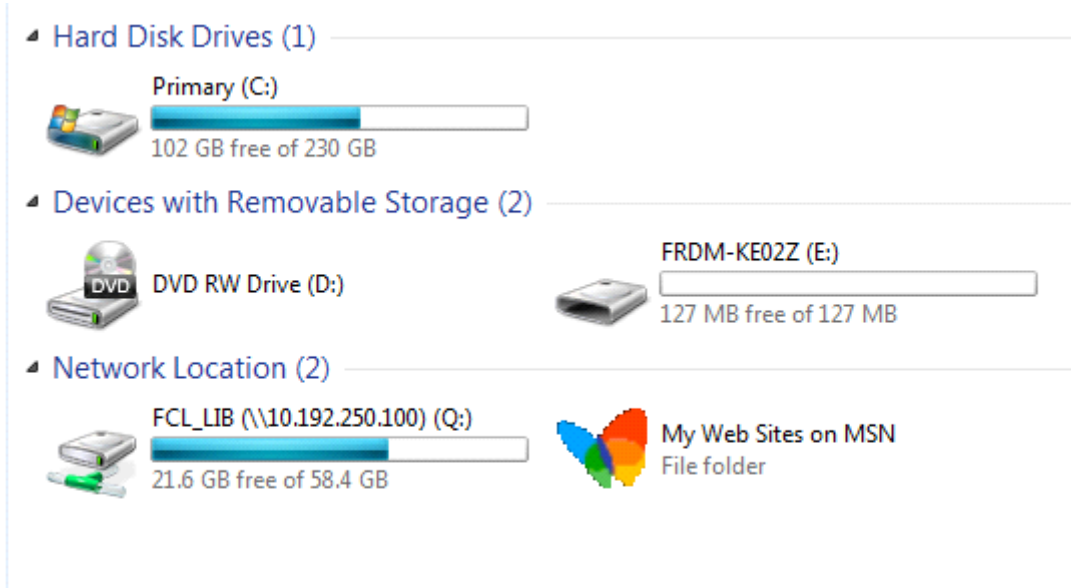
6. On the terminal the following message will appear:



7. The tri-color LED will start blinking.

9 Flashing the precompiled binary onto your board

The FRDM-KE02Z board should come with the OpenSDA MSD application preprogrammed onto the K20 device. If this is the case, the Freedom board will be numbered as a USB mass storage device, and the following icon should be present in the "My Computer" window as shown.

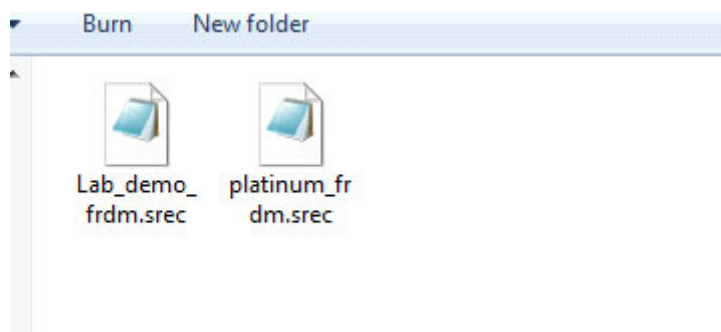


If the FRDM-KE02Z icon is not available, refer to the OpenSDA user's guide to program the MSD application onto the Freedom board. Otherwise, follow these steps to load a precompiled binary onto the KE02Z64:

1. Navigate to the FRDM-KE02Z folder in the file system (C:\FRDM-KE02Z, or double click the FRDM-KE02Z icon in the screen displayed above).
2. The following files should be available:

Date modified	Name	Type
8/8/2012 9:58 PM	FSL_WEB.HTM	HTML Document
8/8/2012 9:58 PM	LASTSTAT.TXT	Text Document
8/8/2012 9:58 PM	SDA_INFO.HTM	HTML Document
8/8/2012 9:58 PM	SERCDC89.CAT	Security Catalog
8/8/2012 9:58 PM	SERCDC89.INF	Setup Information
8/8/2012 9:58 PM	TOOLS.HTM	HTML Document

If they are not, reprogram the board with the MSD application. Otherwise, open a second explorer window and navigate to the location where the precompiled binary application is stored (<root>\ke02-sc\build\binaries).



- Simply "drag and drop" the Lab_demo_frdm.srec file into the FRDM-KE02Z drive and the KE02Z64 will be automatically programmed with the precompiled binary.

10 Revision history

This table provides a revision history for this document.

Table 1. Document revision history

Rev. number	Date	Substantive change(s)
0	07/2013	Initial release.

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