

FREEDOM-KL25Z Sample Code Guide for KEIL MDK

Board configuration, software, and development tools

Rev. 1

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1 Purpose

This Sample Code Guide will familiarize you with Freedom-KL25Z board and development tools. You will learn the features of the Freedom-KL25Z board, the features of the OpenSDA standard, and how to access the source code examples using IAR 6.4 and Processor Expert 10.0 Driver Suite. In addition, instructions are provided to download a precompiled binary file to your board.

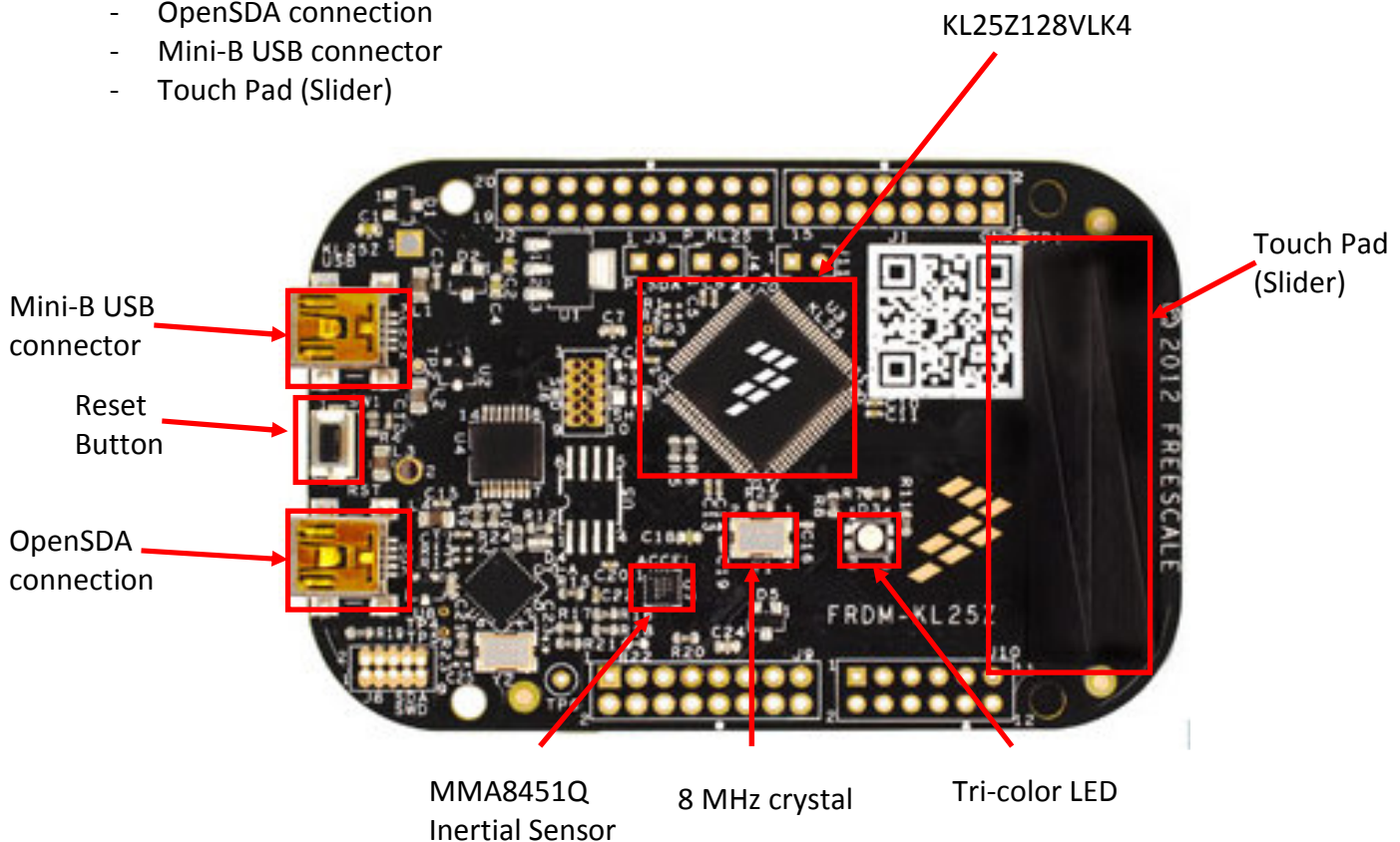
****NOTE****

These driver files have been generated using Processor Expert. If you would like to modify the drivers and create new ones, you may download Processor Expert (instructions are included in this manual). Otherwise, you can use the pre-generated driver files.

2 Getting to know the board

The Freedom board (FREEDOM-KL25Z) features the Kinetis KL25Z128VLK4 microcontroller and comes with the following features (which are highlighted in the figure below):

- Tri-color LED
- 8 MHz crystal
- MMA8451Q Inertial Sensor
- OpenSDA connection
- Mini-B USB connector
- Touch Pad (Slider)



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 bootloader, 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 properly enumerates, you may program the KL25Z128 on your Freedom board with a binary or srec file by simply “dragging and dropping” one of these files into Freedom-KL25 drive that is installed when your Freedom board enumerated. In addition, you will also have serial communication with the KL25Z128.

3.2 Debug Application

This OpenSDA application was also developed by P&E Micro and allows you to program and debug your KL25Z128 on your Freedom board just as any other debugger module would allow. With this application loaded onto your Freedom board, you will also have serial communication with the KL25Z128 available.

4 Download and Install Software and Tools

4.1 Downloading and Installing OpenSDA Drivers

Before you begin, you will need the latest OpenSDA serial drivers installed on your development computer and on FREEDOM-KL25Z. The latest OpenSDA drivers should already be installed on your FREEDOM-KL25Z, and your system should be able to automatically find the latest Windows CDC drivers (as they should be pre-installed on the Freedom board). In 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 4.54 and Tools

4.2.1 Downloading and Installing the KEIL MDK 4.54

To download the KEIL MDK 4.54 (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 your web browser’s address bar and 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 you receive your download.

4.2.2 Downloading and Installing the OpenSDA patch for KEIL MDK

To download and install the OpenSDA patch for the KEIL MDK 4.54, follow these instructions:

1. Navigate to the **Freescale Kinetis OSJTAG Drivers V1.06** download page by opening an internet browser and typing www.keil.com/download/docs/408.asp into your web browser's address bar.
2. At the Freescale Kinetis OSJTAG Drivers V1.06 download page, click on the FSLKINETISDRIVERSV106.EXE link and follow the on screen instructions for saving this file to your computer.
3. Next, navigate to the location where you saved this file, double click the executable and follow the on-screen instructions for installing these files.

4.3 Downloading and Installing Processor Expert Driver Suite 10.0

To download Processor Expert Driver Suite, follow these instructions:

1. Open an internet browser and navigate to the Processor Expert software webpage by typing www.freescale.com/ProcessorExpert into your web browser's address bar.
2. Click on [Processor Expert Software - Microcontroller Driver Suite](#) under Processor Expert Software Suites.



3. From this webpage, you may download the latest Processor Expert Driver Suite. You will download a zip file that should include an installer which will guide you through the installation process.

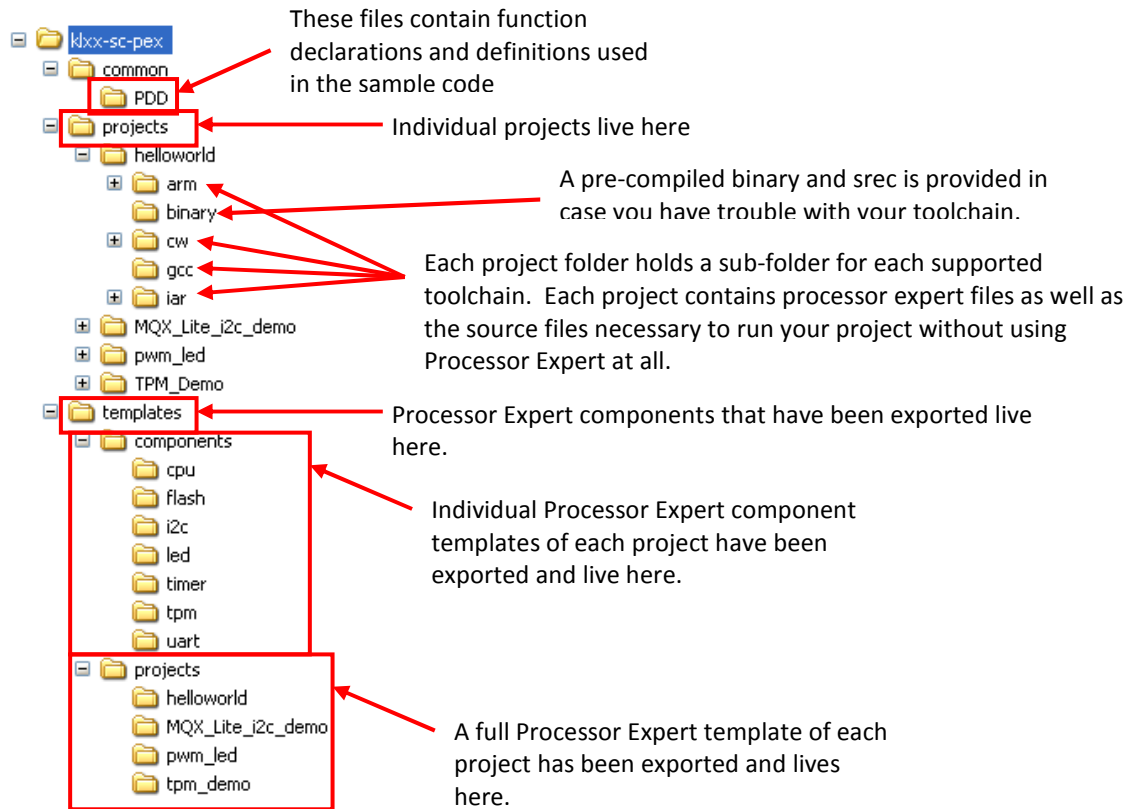
5 Freescale Sample Code

The Freescale sample code base contains two sample code folders: one for a Processor Expert based sample code, and one for a bare project implementation. Freescale recommends using Processor Expert for its scalability and ease of use features. The bare project implementations are provided for those who have applications where Processor Expert does not fit their application or who are not interested in Processor Expert.

5.1 PEx Sample code (klxx-sc-pex)

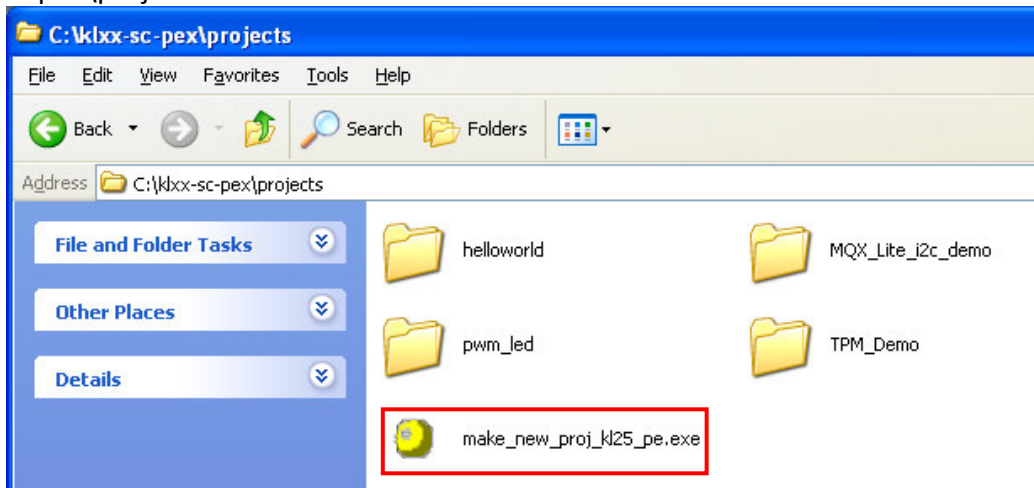
5.1.1 PEx Sample Code Folder Structure

The file tree for your klxx-sc-pex example code is shown below and explanations are provided to the right.



5.1.2 Using the Freescale PEx Sample Code to Jumpstart your Design

The Kinetis L Family sample code is provided as a jump start for your design, as well as providing you with code examples. To facilitate this, we have provided a script that will copy our helloworld project and rename it to your desired project name. This script is a single executable that resides in the klxx-sc-pex\projects folder.

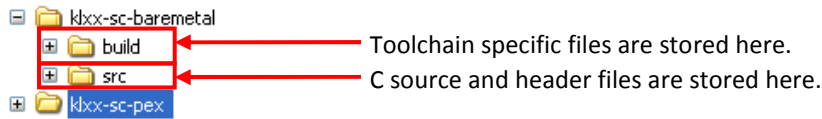


Simply double-click this icon and a command prompt pop-up window will prompt you for a project name, copy the helloworld project and rename all of the necessary files for your new project to work correctly.

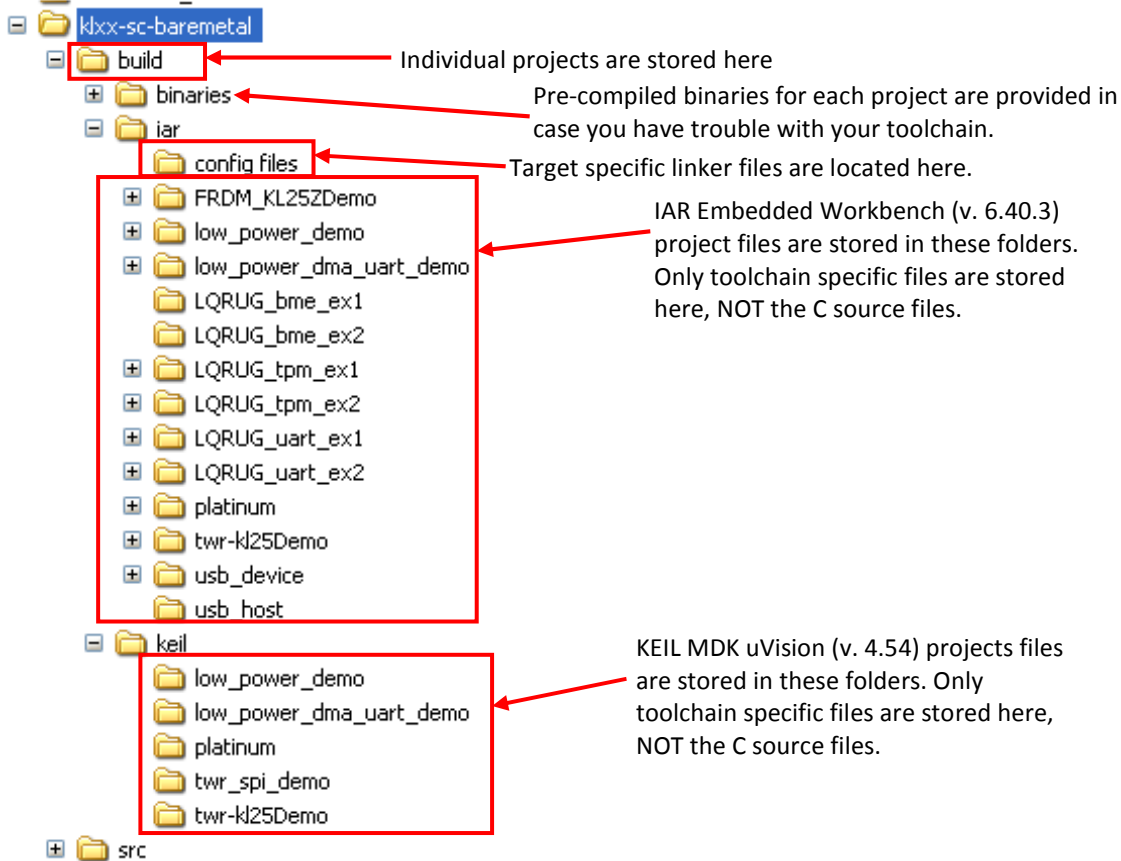
5.2 Baremetal Sample Code (klxx-sc-baremetal)

5.2.1 Baremetal Sample Code Folder Structure

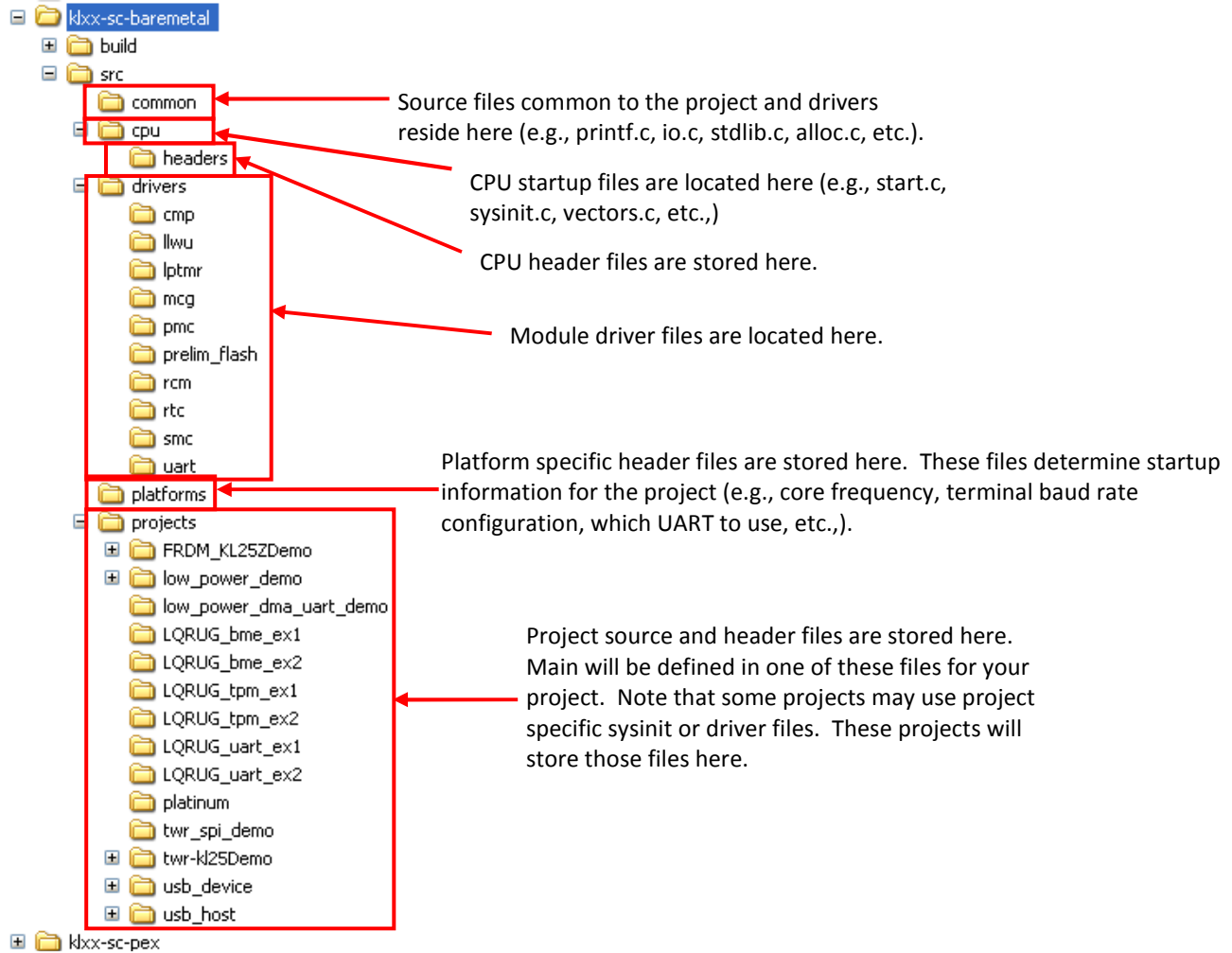
The Baremetal sample code folder contains two folders at the top level: a build folder and an src (source) folder.



First, the build folder will be discussed.

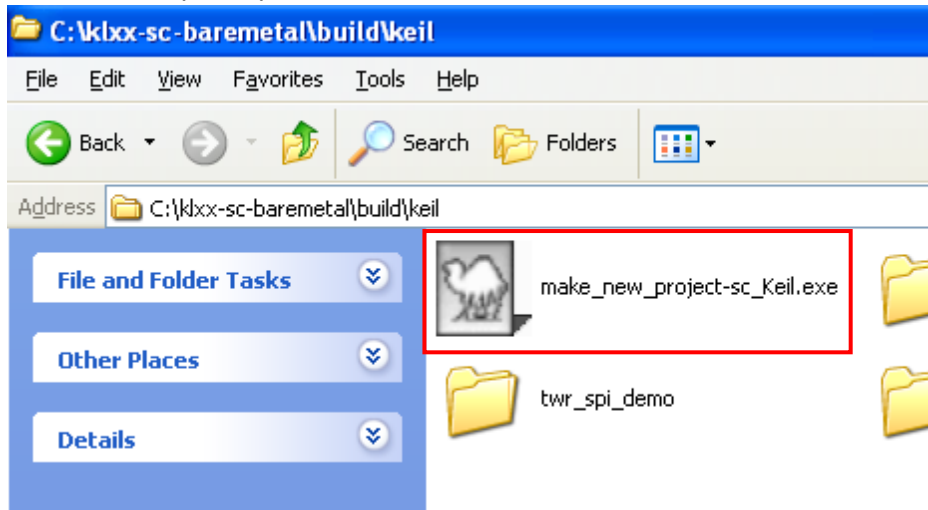


The source folder structure is as follows:



5.2.2 Using the Freescale Baremetal Sample Code to Jumpstart your Design

The Kinetis L Family sample code is provided as a jump start for your design, as well as providing you with code examples. To facilitate this, we have provided a script that will copy our platinum project and rename it to your desired project name. This script is a single executable that resides in the klxx-sc-baremetal\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 for your new project to work correctly.

6 Configure Hardware

- 1) Using a Mini-B to A USB cable, connect your Freedom-KL25Z board to your development computer. Be sure to plug the Mini-B connection into the OpenSDA port of the Freedom-KL25Z 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 enumerate just as any other USB to serial converter. Therefore, you will need to open a serial terminal utility (Tera Term, Hyperterm, etc.,) and configure your terminal as follows:

- 115,200 baud
- 8 data bits
- no parity
- no flow control.


8 Loading and Running the Demos in KEIL MDK 4.54


The following instructions describe how to build and flash the helloworld demo using IAR 6.4.3. This document is targeted for users who choose to use the OpenSDA programming and debugging

capabilities and it is assumed that you have loaded the P&E Micro Debug application onto your Freedom-KL25Z. If you need assistance in loading this application onto your Freedom-KL25Z, please refer to the OpenSDA user's guide provided in your Quick Start Package.

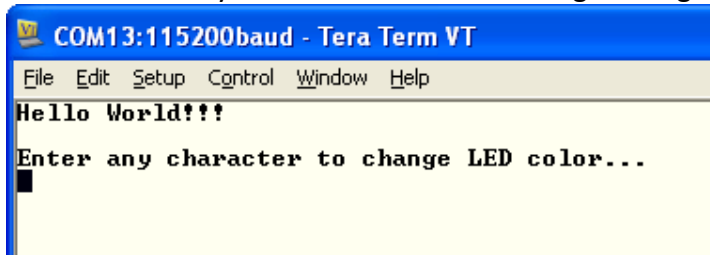
- 1) Open KEIL uVision4 (Start->All Programs->KEIL uVision4).
- 2) Open the workspace at `..\klxx-sc-pex\projects\helloworld\arm\helloworld.uvproj`. This can be done by either dragging the helloworld.uvproj icon into the KEIL Workspace or by selecting Project->Open Project... and pointing KEIL to the 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 .

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

- 6) On the terminal you should see the following message:



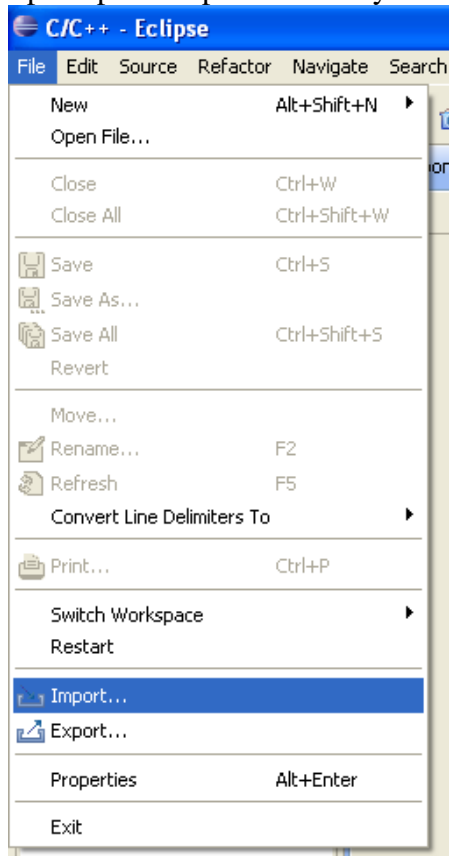
- 7) Entering characters will cycle through the possible LED colors as well as echo the characters to the terminal.

9 Loading the Demos in Processor Expert 10.0 Driver Suite

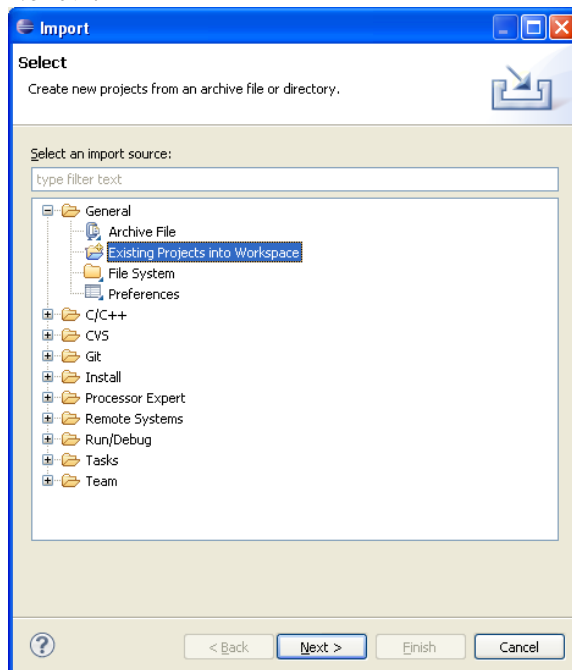
The following instructions describe how to load and generate code using Processor Expert Driver Suite.

1. Open Processor Expert 10.0 by navigating to `<PEX root>\eclipse` (if you chose to install PEX in the default location, `<PEX root>` will be `C:\Freescale\PEXDriverSuite v10.0.0`). Click on the eclipse.exe icon.
2. You will be prompted to select a workspace location. You may choose the default workspace location or you may choose a more convenient location. After selecting the workspace location, click "OK".

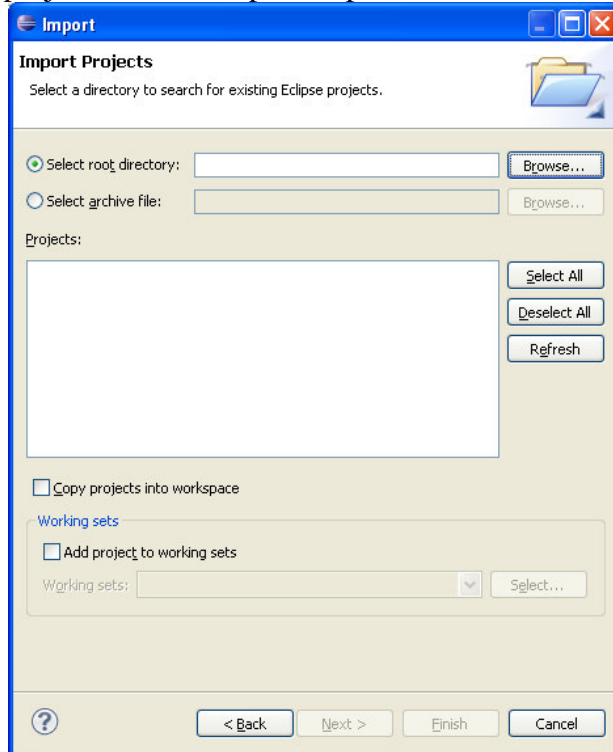
3. Open up the import wizard by selecting File->Import...



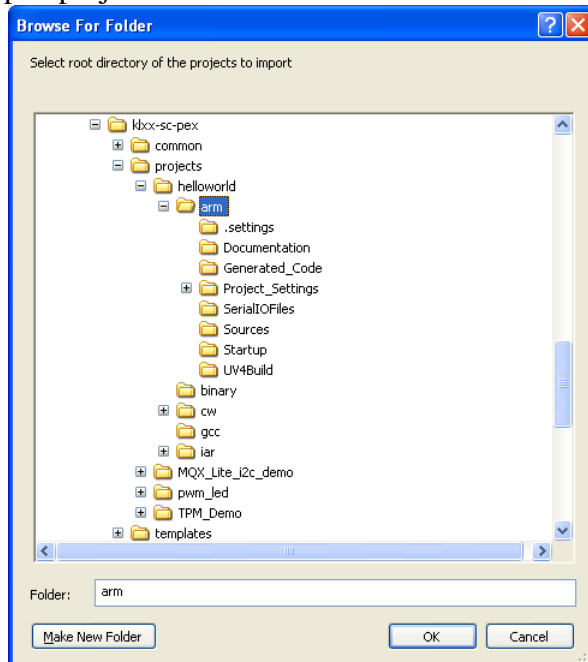
4. In the Import dialog box, choose General->Existing Projects into Workspace and click Next >.



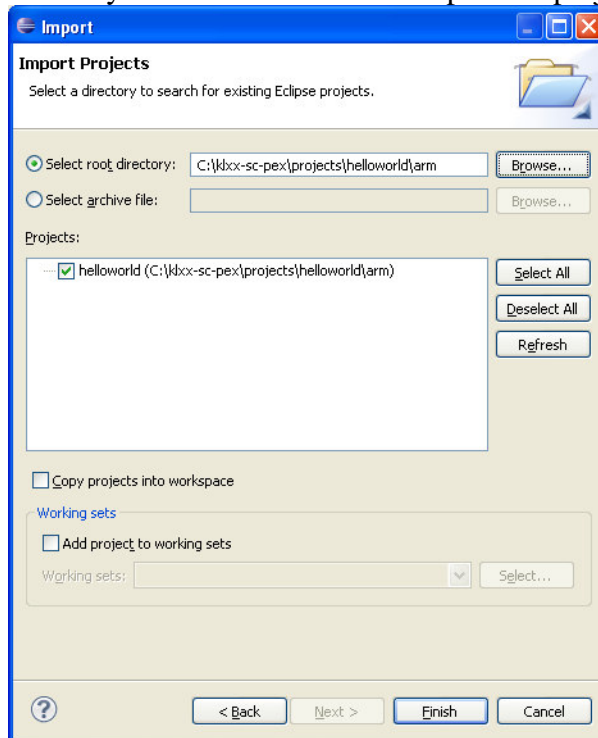
- At the next screen, choose the “Select root directory:” option, ensure that the “Copy projects into workspace” option is not selected and then click “Browse...”.



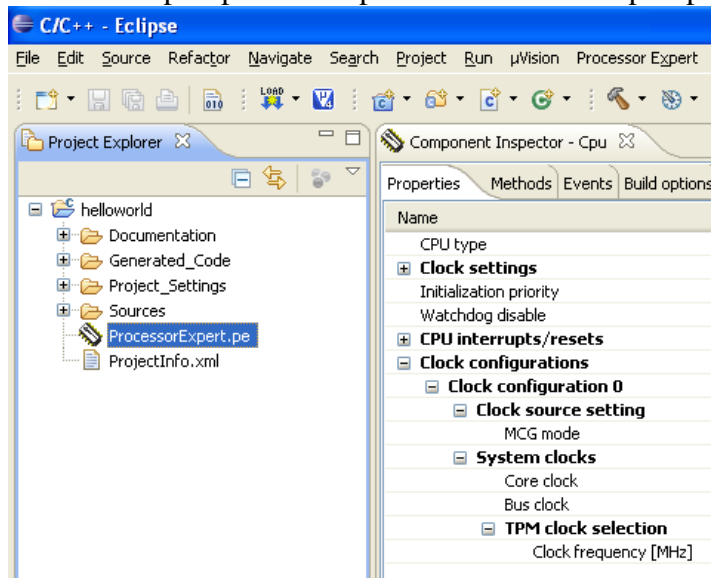
- In the “Browse For Folder” dialog box, point PEXDS to the klxx-sc-pex\projects\helloworld\arm.



7. PExDS will find the helloworld Project and automatically select it in the projects box. You may now click “Finish” to import the project into your workspace.



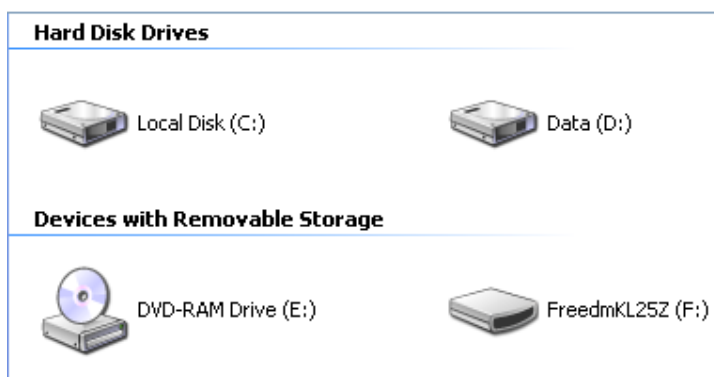
8. Now that the project is loaded, expand the helloworld folder by clicking the plus sign to the left of the folder name in the Project Explorer pane and then single click the ProcessorExpert.pe file to open the Processor Expert project.



9. For information on how to make changes, generate code, and use Processor Expert, refer to the Processor Expert Driver Suite Getting Started Guide (PEXDRVGETSTARTEDUG) available in the Processor Expert files and at the Processor Expert web page (www.freescale.com/ProcessorExpert).

10 Flashing the Pre-compiled Binary onto your Board

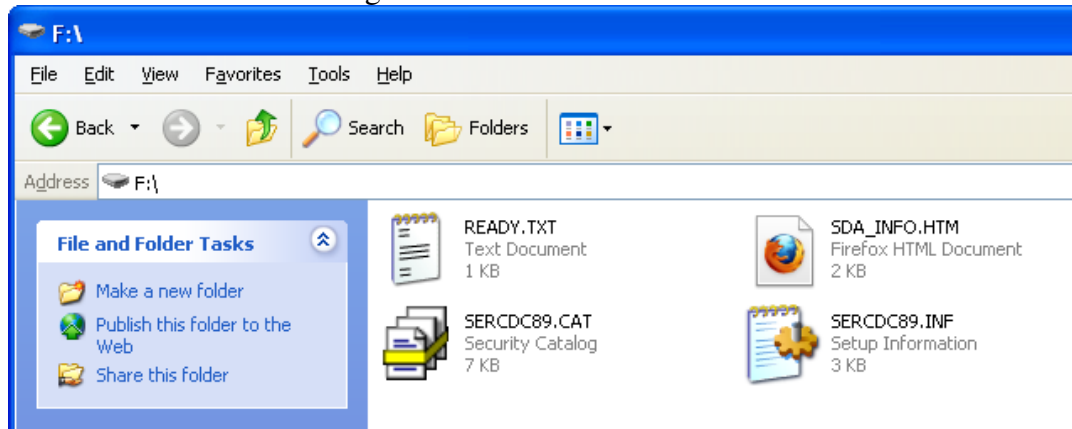
Your FREEDOM-KL25Z board should come with the OpenSDA MSD application preprogrammed onto the K20 device. If this is the case, you should see the Freedom board enumerate as a USB mass storage device and the following icon should be present in your “My Computer” window as shown.



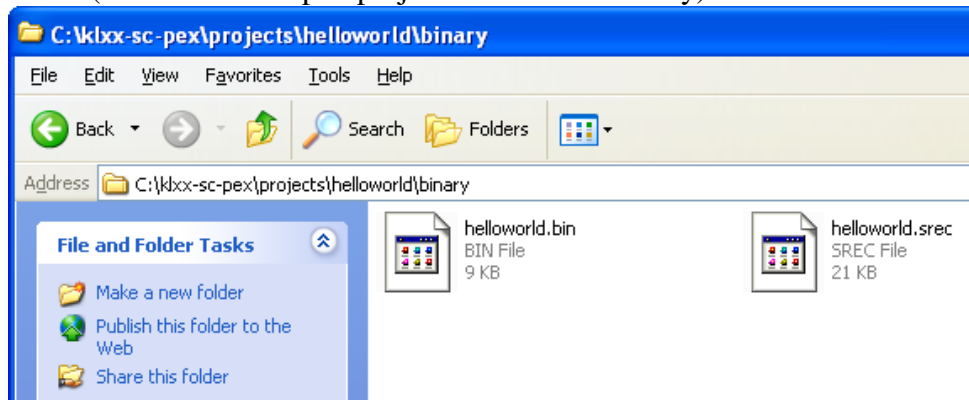
If the FreedomKL25Z icon is not available, please refer to the OpenSDA User’s Guide to program the MSD application onto your Freedom board. Otherwise, follow these steps to load a pre-compiled binary onto your KL25Z128:

1. Navigate to the FreedomKL25Z folder in your file system (C:\FreedomKL25Z, or you may double click the FreedomKL25Z icon in the screen displayed above).

2. You should see the following files:



If you do not, reprogram your board with the MSD application. Otherwise, open a second explorer window and navigate to the location where your pre-compiled binary application is stored (<root>\klxx-sc-pex\projects\helloworld\binary).



3. Simply “drag and drop” the helloworld.bin or the helloworld.srec file into the FreedmKL25Z drive and the KL25Z128 will be automatically programmed with the pre-compiled binary.