FREEDOM-KL26Z Sample Code Guide for CodeWarrior

Board configuration, software, and development tools Rev. 0

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1 Purpose

This Sample Code Guide will familiarize you with Freedom-KL26Z board and development tools. You will learn the features of the Freedom-KL26Z board, the features of the OpenSDA standard, and how to access the source code examples using CodeWarrior 10.4(or later) and the integrated Processor Expert 10.0 (or later). In addition, instructions are provided to download a precompiled binary file to your board.

2 Getting to know the board

The Freedom board (FREEDOM-KL26Z) features the Kinetis MKL26Z128VLH4 microcontroller and comes with the following features (which are highlighted in the figure below):

Tri-color LED 8 MHz crystal FXOS8700CQ Inertial Sensor **OpenSDA** connection Mini-B USB connector Touch Pad (Slider) MKL26Z128VLH4 SW1 Push Button SW1 Push Button **Touch Pad** (Slider) Mini-B USB connector Reset **Button** OpenSDA _ connection FXOS8700CO Tri-color LED 8 MHz crystal **Inertial Sensor**

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 that 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 KL26Z128 on your Freedom board with a binary or srec file by simply "dragging and dropping" one of these files into Freedm-KL26 drive that is installed when your Freedom board enumerated. In addition, you will also have serial communication with the KL26Z128.

3.2 Debug Application

This OpenSDA application was also developed by P&E Micro and allows you to program and debug your KL26Z128 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 KL26Z128 available.

4 Download and Install Software and Tools

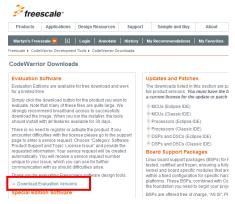
4.1 Downloading and Installing OpenSDA Drivers

Before you begin, you will need the latest OpenSDA serial drivers installed on your development computer and on your FREEDOM-KL26Z. The latest OpenSDA drivers should already be installed on either of these, and your system should be able to automatically find the latest Windows CDC drivers (as they should be pre-installed on the Freedom board). If they are not, please navigate to <u>www.pemicro.com/opensda/index.cfm</u> and follow the directions on this page to download the correct OpenSDA files. You may also refer to the OpenSDA user's guide which can be found in your Quick Start Package.

4.2 Downloading and Installing CodeWarrior 10.4(or later)

To download CodeWarrior 10.4 (or later), follow these instructions:

- 1. Open an internet browser and navigate to the CodeWarrior Downloads webpage by typing <u>http://www.freescale.com/codewarrior/downloads</u> into your web browser's address bar.
- 2. Next, navigate to the Downloads page.





3. Under Software Development Tools, select CodeWarrior for Microcontrollers 10.4 (or later) (you may select either the offline or online version).

aluation Software Design Tools ftware Development Tools IDE - Debug, Compile and Build Tools	Select eith	er of th	iese		
ID and Description	Vendor ID	Format	Size X	Rev #	Availability
Evaluation: CodeWarrior for Microcontrollers 10.5 (Eclipse, Online) UPDATED This image contains the CW MCU v10.5 core tools and an installer, which assumes your computer has internet access. During the installation process the core tools will be installed and you will be asked to select the Freescale architecture support you	FREESCALE	exe	421888	10.5	Download
Evaluation: CodeWarrior for Microcontrollers 10.5 (Eclipse, Offline) UPDATED This image contains the complete CW MCU v10.5 tool suite and an installer, which assumes your computer does NOT have internet access. All data needed by the installer will be downloaded now and no other download will be performed.	FREESCALE	exe	1368064	10.5	Download
Evaluation: CodeWarrior for Microcontrollers (Classic, Windows-hosted) Supports RS08, HC08, S08, V1 ColdFire devices. 🞯	FREESCALE	exe	458013	6.3	Download

- 4. Follow Freescale's downloading and licensing instructions to download your CodeWarrior software.
- 5. To install software tools, follow the installer package instructions.

5 Freescale Sample Code

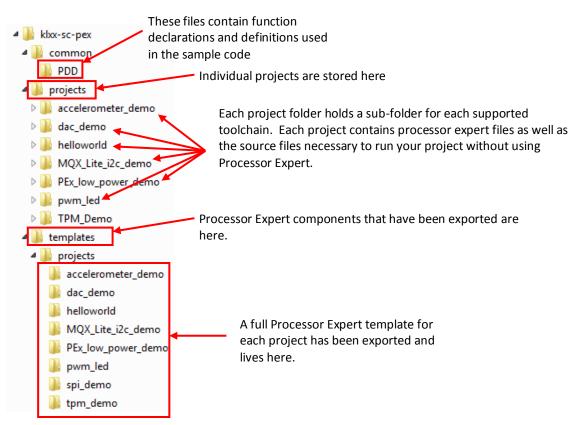
The Freescale sample code base contains two sample code folders: one for a Processor Expert based sample code, and one for a bare project implementation. Freescale recommends using Processor Expert for its scalability and ease of use features. The bare project implementations are provided for those who 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

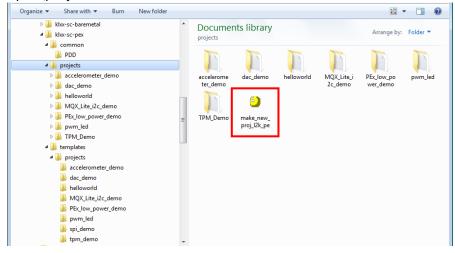
The file tree for your klxx-sc-pex example code is shown below and explanations are provided to the right.





5.1.2 Using the Freescale PEx Sample Code to Jumpstart your Design

The Kinetis L Family sample code is provides 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.



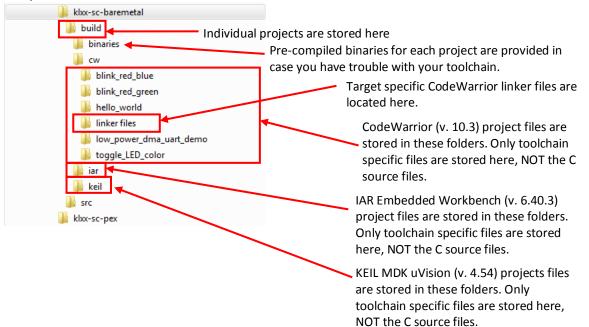
5.2 Baremetal Sample Code (klxx-sc-baremetal)

5.2.1 Baremetal Sample Code Folder Structure

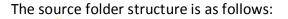
The Baremetal sample code folder contains two folders at the top level: a build folder and an src (source) folder.

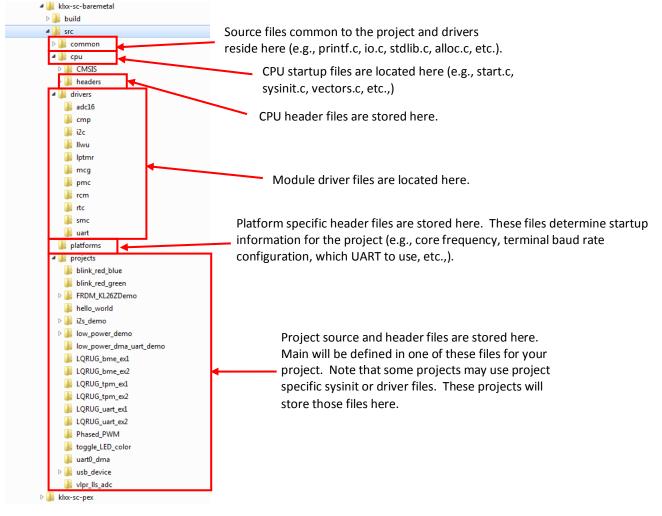
4 🍌 klxx-sc-baremetal		
build	Toolcha	in specific files are stored here.
src	C source	and header files are stored here.
🖻 🌉 klxx-sc-pex		

First, the build folder will be discussed.





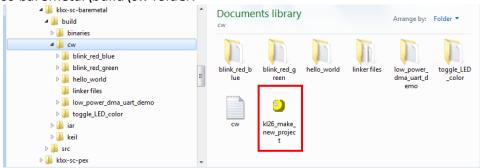






5.2.2 Using the Freescale Baremetal Sample Code to Jumpstart your Design

The Kinetis L Family sample code is provides 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\cw 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-KL26Z board to your development computer. Be sure to plug the Mini-B connection into the OpenSDA port of the Freedom-KL26Z 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:

- 19,200 baud (or 115,200 baud for select projects)
- 8 data bits
- 1 stop bit
- no parity
- no flow control.

8 Loading and Running the Demos into CodeWarrior 10.4

The following instructions describe how to build and flash the helloworld demo using CodeWarrior 10.4. 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-KL26Z. If you need assistance in loading this application onto your Freedom-KL26Z, please refer to the OpenSDA user's guide provided in your Quick Start Package.



- 1) Open CodeWarrior 10.4 (Start->All Programs->Freescale CodeWarrior->CW for MCU v10.4->CodeWarrior).
- 2) Import the workspace at ..\klxx-sc-pex\projects\helloworld\cw.
 - a. Open up the import wizard by selecting File->Import...

Profiles\B38350\My	Documents\Code
File Edit Search Project Run PEMicr	• Processor Expert
New	Alt+Shift+N 🕨
Open Path	Ctrl+Shift+A
Open File	
Close	Ctrl+W
Close All	Ctrl+Shift+W
🕌 Save	Ctrl+S
🗟 Save As	
n Save All	Ctrl+Shift+S
Revert	
Move	
Rename	F2
🔊 Refresh	F5
Convert Line Delimiters To	,
👜 Print	Ctrl+P
Switch Workspace	•
Restart	
🔁 Import	
🛃 Export	
Properties	Alt+Enter
1 Events.h [accelerometer_demo/Sourc	es]
2 IO1.h [helloworld/Generated_Code]	
3 ProcessorExpert.c [helloworld/Source	-
4 ProcessorExpert.c [TPM_Demo/Source	es]
Exit	

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

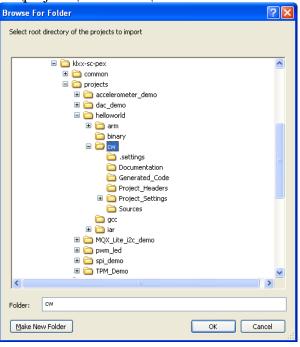
🖨 Import	
Select Create new projects from an archive file or directory.	Ľ
Select an import source: type filter text General Archive File Stating Projects into Workspace File System Preferences C/C++ Gr C/C++ Gr C/C++ Froessor Expert Froessor Expert Froess	
(2) < Back Next > Einish	Cancel



c. 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…".

🖨 Import	
Import Projects Select a directory to search for existing Eclipse projects.	
Select root directory: Select archive file: Projects:	Browse
	Select All Deselect All Refresh
Copy projects into workspace Working sets Add project to working sets Working sets:	Sglect
(?) < Back Next > Einish	Cancel

d. In the "Browse For Folder" dialog box, point CodeWarrior to the klxx-scpex\projects\helloworld\cw folder.

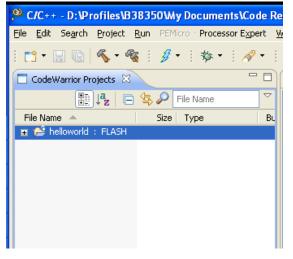




e. CodeWarrior will find the helloworld Project and automatically select it in the projects box. You may now click "Finish" to import the project into your workspace.

🖨 Import		
Import Projects Select a directory to searc	ch for existing Eclipse projects.	
 Select root directory: Select archive file: Projects: 	C:\kkx-sc-pex\projects\helloworld\jar\PE	Browse
V helloworld (C:\kix	x-sc-pex\projects\helloworld\iar\PE)	Select All Deselect All Refresh
Copy projects into working sets	·	Sglect
?	<back next=""> Finish</back>	Cancel

3) Ensure that the project is selected in the projects tab.



4) Compile the project by clicking the Build icon "Make").

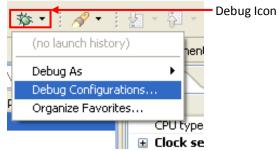
5

(or right click on the project and select

5) After compilation completes, launch the OpenSDA debugger configuration by following these instructions:



a. Left click on the down arrow next to the debug icon and select "Debug Configurations".



b. In the pop-up dialog box, select "helloworld_FLASH_OpenSDA" from the CodeWarrior Download group from the left side of the dialog box.

P Debug Configurations					
Create, manage, and run configurations Download an application to a target, then debug or run the application.					
Image: Second state in the second	Name: helloworld_F Main (X)= Arc C/C++ application Project: hellc Application: FLAS Build (if required) I Build configuratio				

- c. Click the "Debug" button.
- 6) CodeWarrior will automatically change the perspective to the Debug perspective and pause at the first instruction. Hit the "Resume" button to start running.



7) On the terminal you should see the following message:

👺 COM13:115200baud - Tera Term VT					
<u> Eile Edit S</u> etup C <u>o</u> ntrol <u>W</u> indow <u>H</u> elp					
Hello World!!!					
Enter any character to change LED color					

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



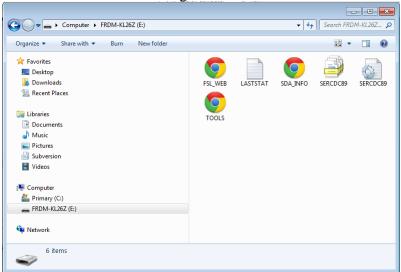
9 Flashing the Pre-compiled Binary onto your Board

Your FREEDOM-KL26Z board should come with the OpenSDA MSD application preprogrammed onto the K20 device. If this is the case, you should see the Freedom board enumérate as a USB mass storage device and the following icon should be present in your "My Computer" window as shown.

🕽 🔾 🗢 🎠 Computer 🕨	
Organize - Eject Properties System properties	Uninstall or change a program 🔹 📜 👔
 ✓ Favorites ☑ Desktop ☑ Downloads ☑ Recent Places ☑ Documents ☑ Ducuments ☑ Pictures ☑ Subversion ☑ Videos 	Hard Disk Drives (1) Primary (C) 164 GB free of 297 GB Devices with Removable Storage (2) DVD RW Drive (D:) FRDM-KL262 (E:) 127 MB free of 127 MB
Primary (C.) FRDM-KL26Z (E:)	
FRDM-KL26Z (E:) Space used: Removable Disk Space free: 127 MB	Total size: 127 MB File system: FAT

If the FRDM-KL26Z 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 KL26Z128:

- 1. Navigate to the FRDM-KL26Z folder in your file system (C:\FRDM-KL26Z, or you may double click the FRDM-KL26Z 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 hello_world.srec file into the FreedmKL26Z drive and the KL26Z128 will be automatically programmed with the pre-compiled binary.

kbx-sc-pex common projects accelerometer_demo dac_demo helloworld arm binary	Arrange by: Folder ▼
 binary cw settings Documentation Generated_Code Project_Headers Project_Settings Sources iar MQX_Lite_i2c_demo PEx_low_power_demo pwm_led TPM_Demo templates 	
helloworld Date modified: 9/30/2013 3:19 PM SREC File Size: 21.2 KB	Date created: 10/3/2013 1:20 PM