Freescale Semiconductor, Inc
User's Guide

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Integration of the USB Stack and Kinetis SDK

1 Overview

This document describes how to compile the USB stack and examples, download a binary image, and run the examples. The TWR-K22F120M Tower System module is used as an example board.

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2 Requirements for Building USB Examples

The TWR-K22F120M Tower System module is used as an example in this document. Compiling, downloading, and running examples are similar on all other boards.

2.1 Hardware

- TWR-K22F120M Tower System module
- (Optional) TWR-SER Tower System module and Elevator
- J-Link debugger(optional)
- USB cables

2.2 Software

- KSDK release package
- IAR Embedded Workbench for ARM® Version 7.20.2
- Keil µVision5 Integrated Development Environment Version 5.11, available for Kinetis ARM Cortex®-M4 devices
- Kinetis Design Studio [beta] Version: 1.1

3 Board Jumper Settings

This document focuses on the USB-related jumper settings on the board. For other jumper settings, see the board-related user's guide. The board jumper settings are provided for all supported boards.

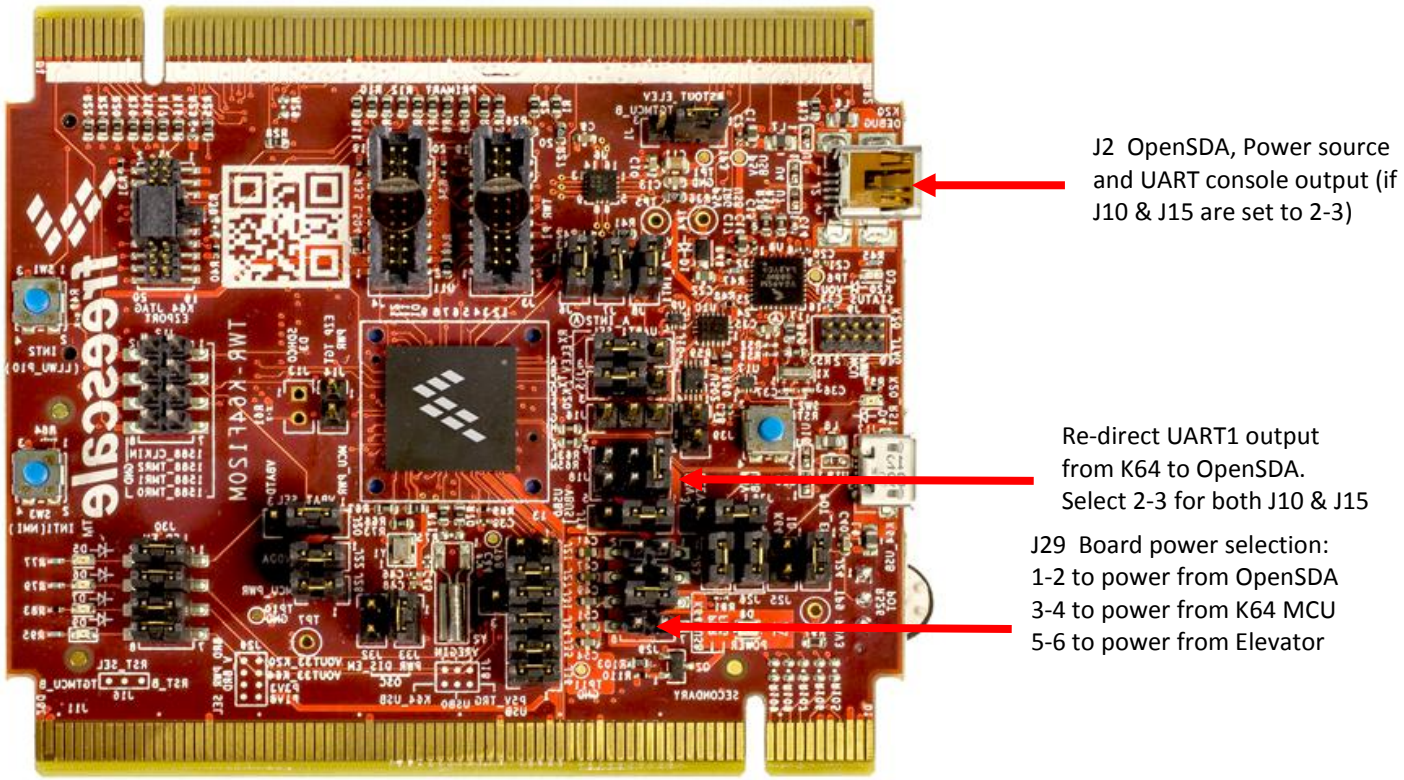

Figure-1 TWR-K64 Tower System module

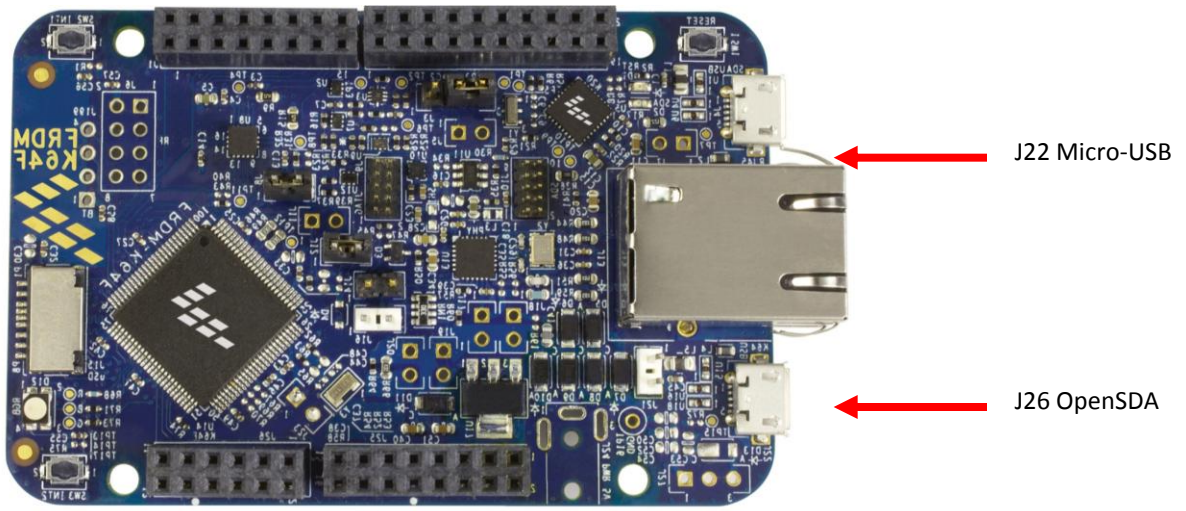

Figure-2 Freescale Freedom FRDM-K64F platform

- Connect J21
- Install a 2.2uF capacitor in the position C33 as shown.

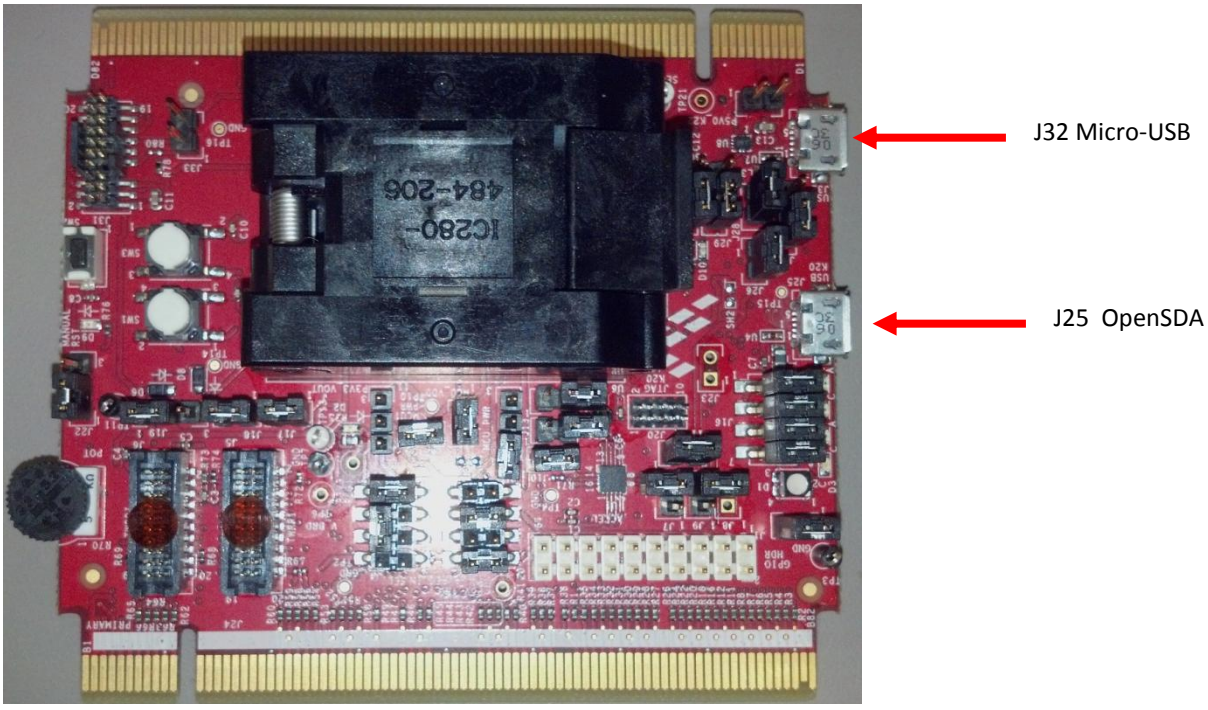

Figure-3 TWR-K22 Tower System module

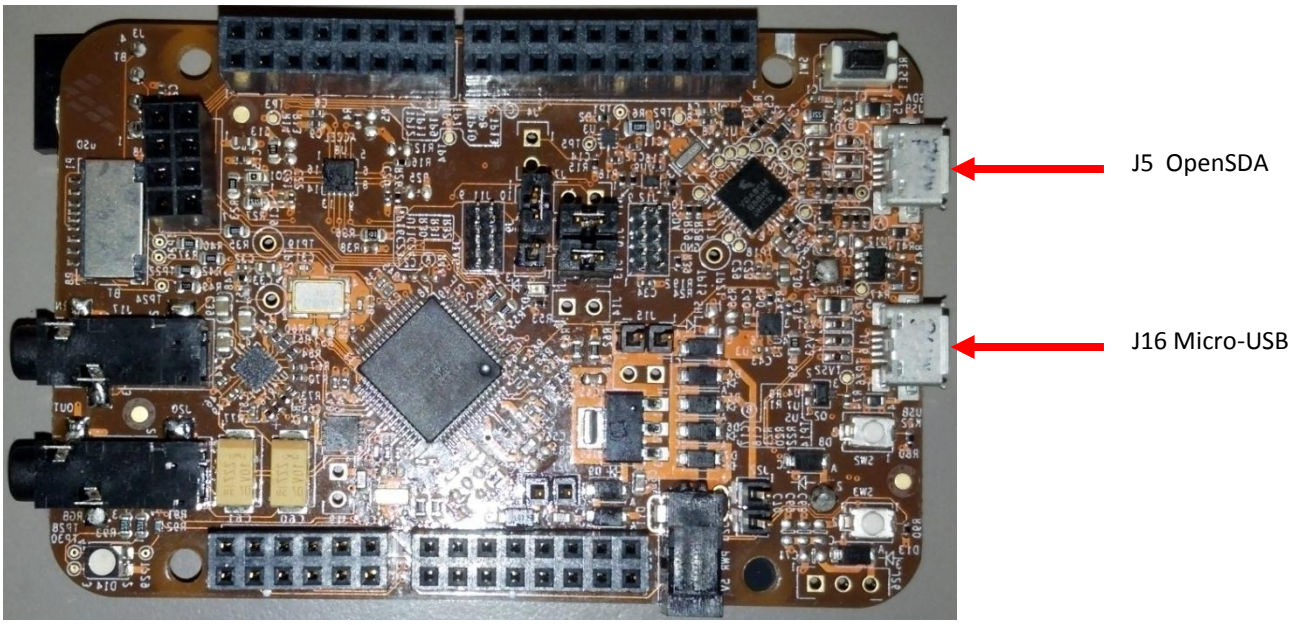

Figure-4 Freescale Freedom FRDM-K22 platform

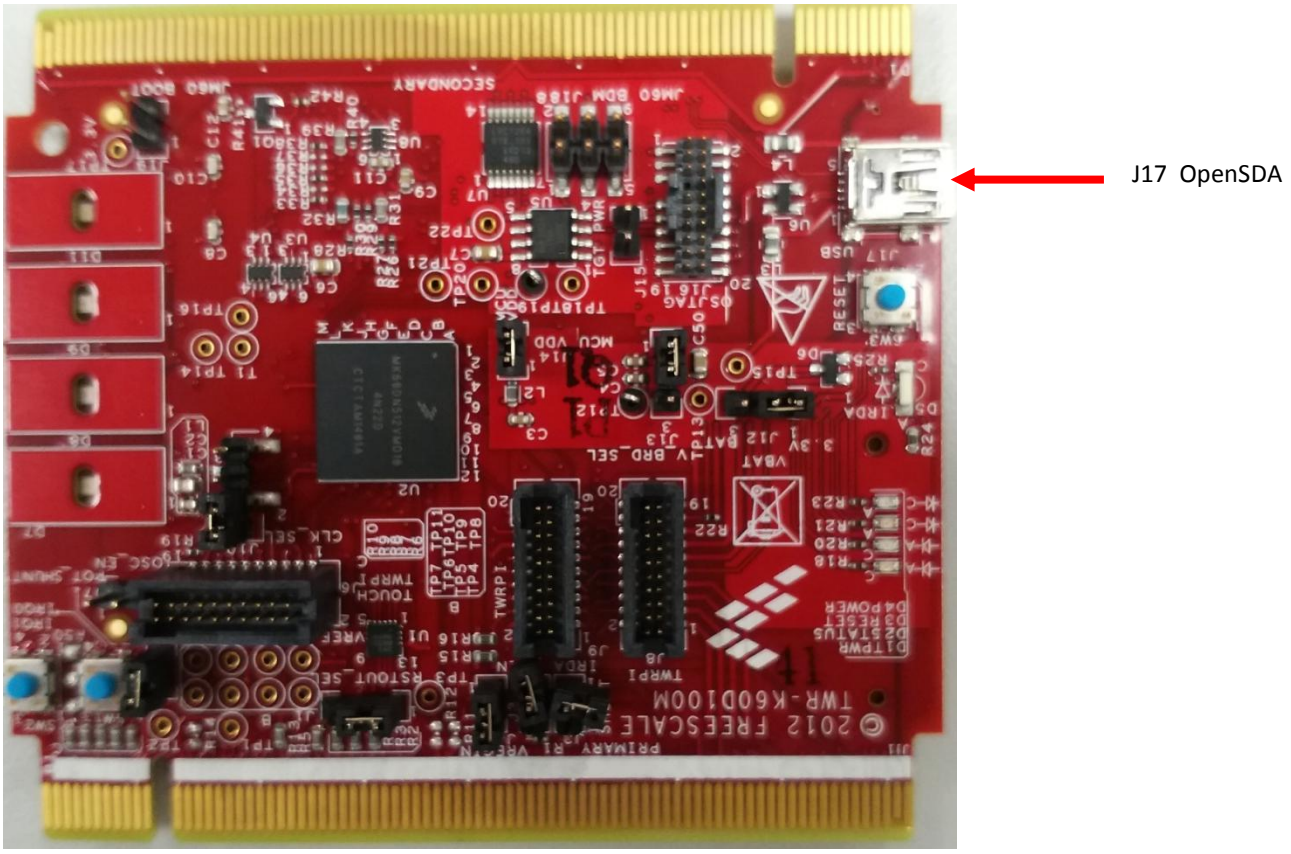

Figure-5 TWR-K60 Tower System module

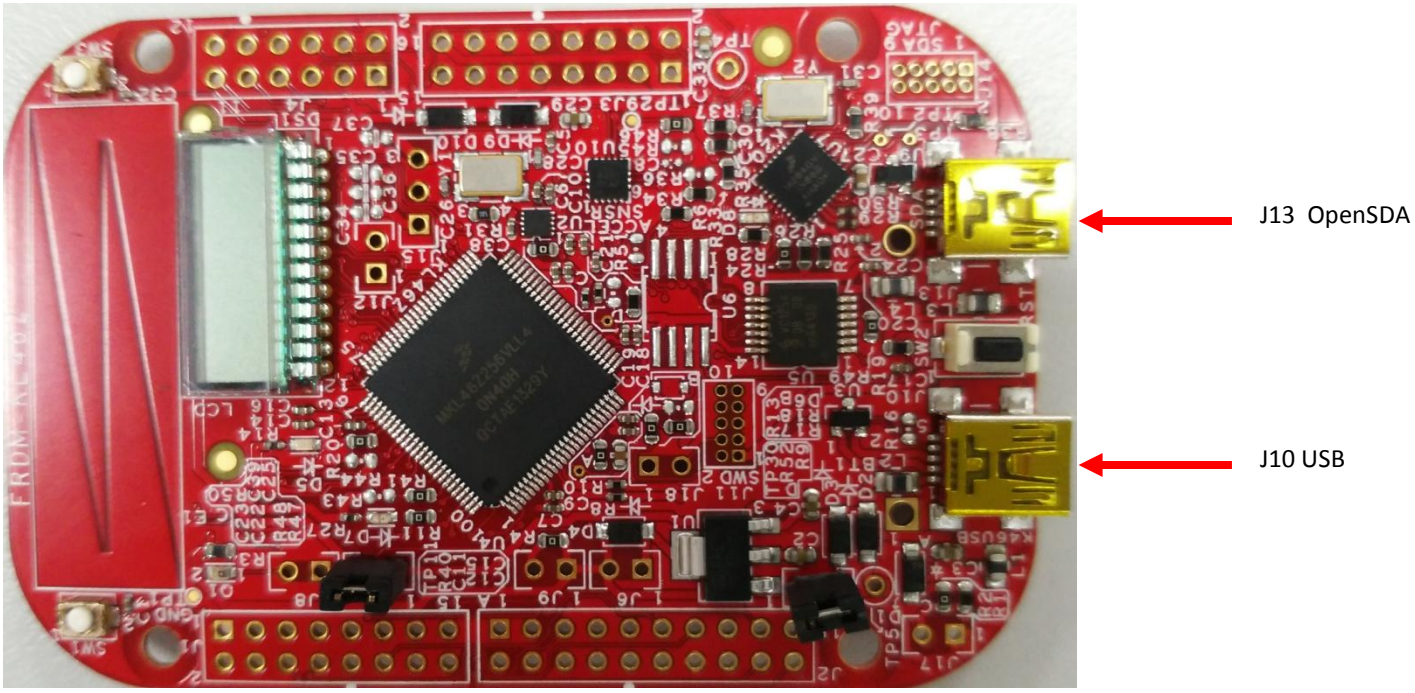

Figure-6 Freescale Freedom FRDM-KL46 platform

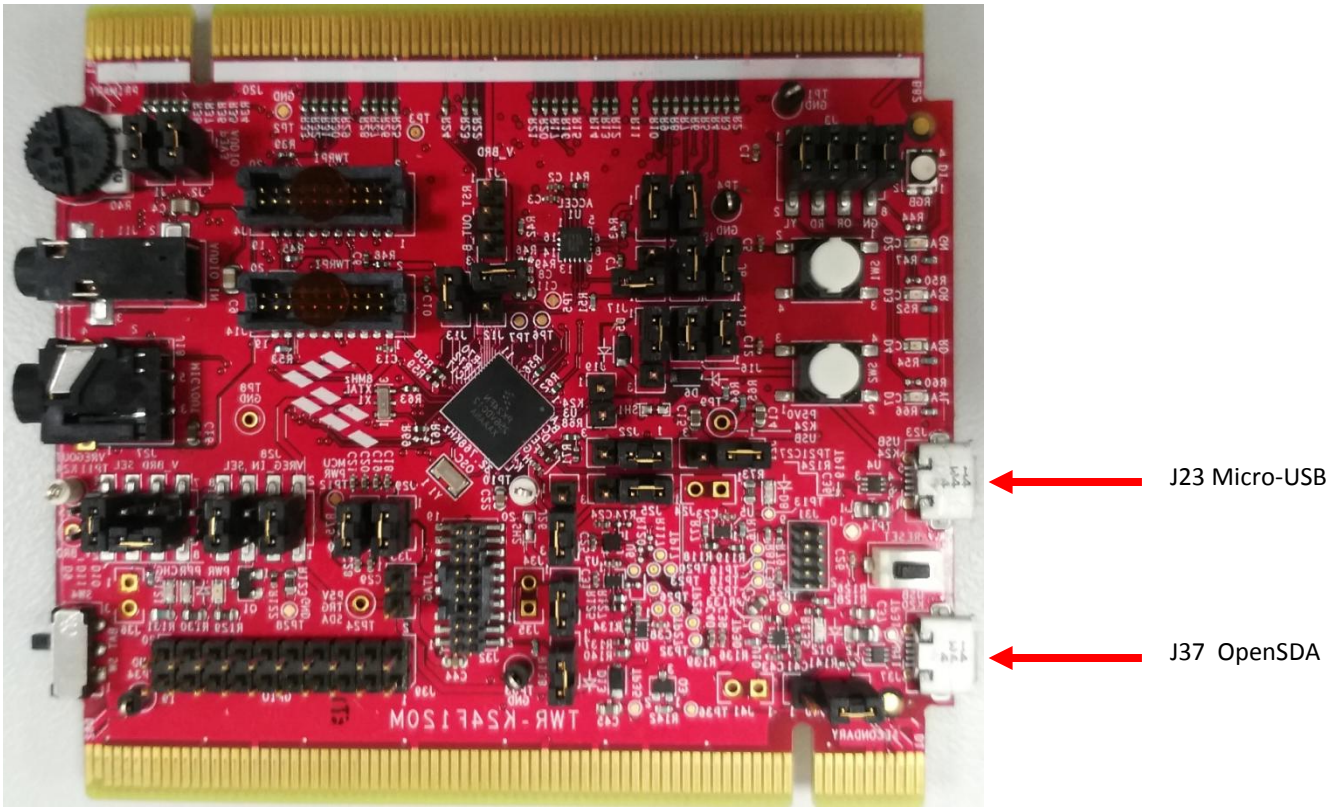

Figure-7 TWR-K24 Tower System module

4 USB Code Structure

The USB code is located in the usb folder in the root level of the KSDK_1.0.0 folder.

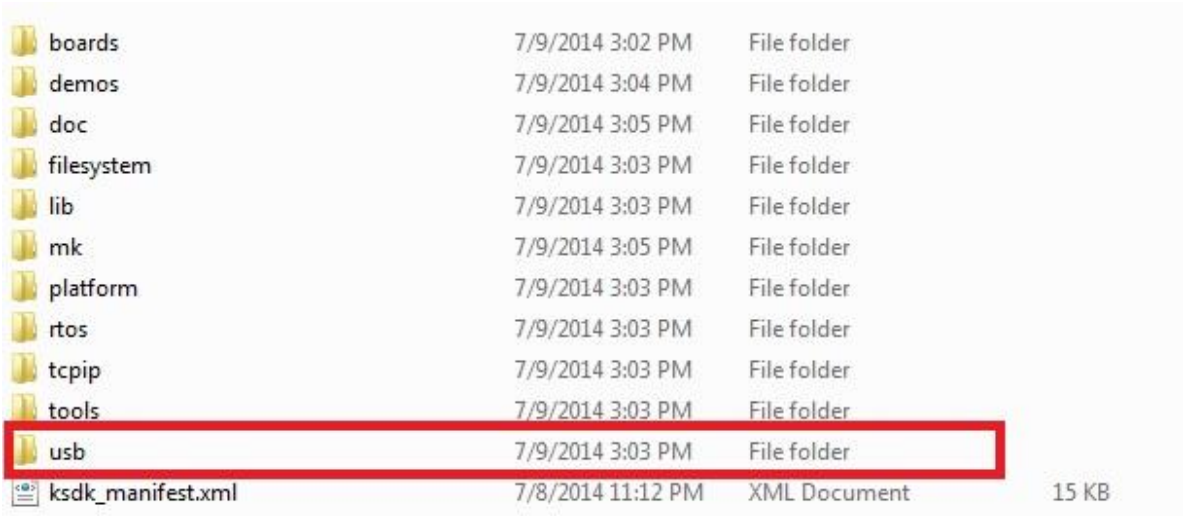

Figure-8 Kinetis SDK folder structure

The USB folder includes the source code, projects, and tools.

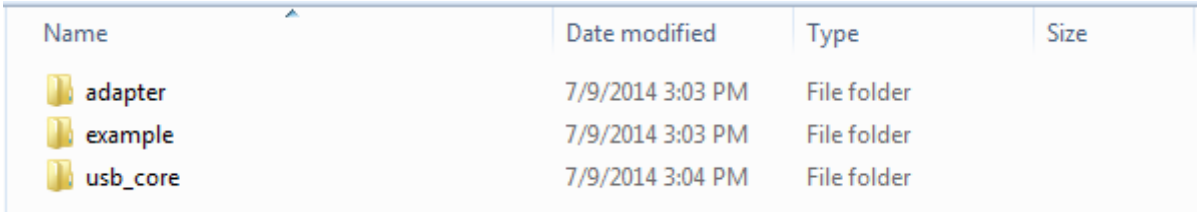

Figure-9 USB Folder Structure

The USB folder includes three subfolders:

- adapter

  This subfolder includes the adapter files to support the USB stack running on a different RTOS with the same USB core code.

- example

  This subfolder includes all source code and project files for the USB examples.

- usb_core

  This subfolder includes the USB source files, such as HAL, controller driver, class drivers, and the USB library projects.

5 Compiling or Running the USB Stack and Examples

5.1 Step-by-step guide for IAR

This section shows how to use IAR. Open IAR as shown in this figure:

1. Open the workspace corresponding to different examples.

   For example, the host_hid_mouse_twrk22f120m_bm.eww is located under the <Install_dir>/usb/example/host/hid/mouse/sdk/iar/host_hid_mouse_twrk22f120m_bm.

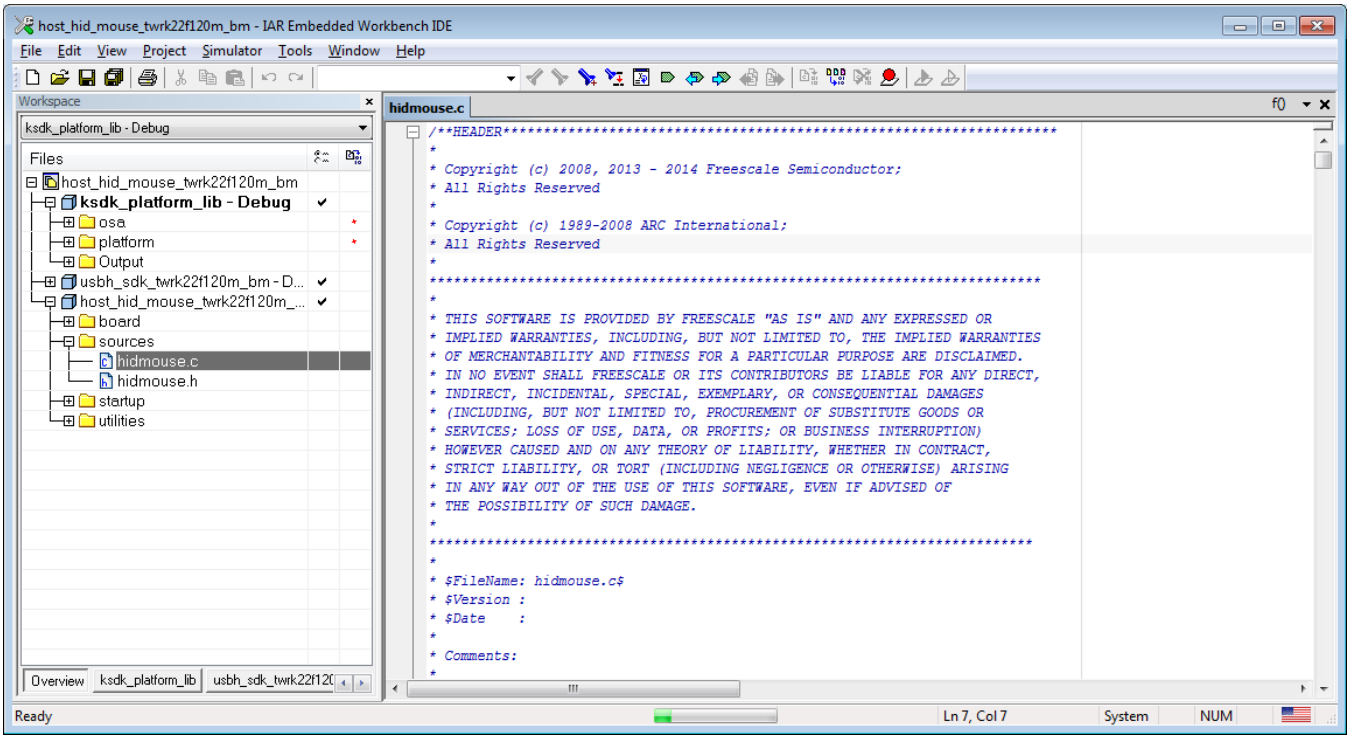

Figure-10 IAR workspace

2. Build the ksdk_platform_lib library.
3. Build the usbh_sdk_twrk22f120m_bm library.
4. Check the USB library build result.

- After the USB library is built, the generated library binary file (usbh.a) is located in `output/twrk22f120m.iar/debug/usbh/sdk/`.
- All USB-related public header files are copied to this folder.

5. Build the host_hid_mouse_twrk22f120m_bm example.
6. Connect the micro USB cable from a PC to the J25 of the TWR-K22F120M Tower System module to power on the board.

7. Click **Download and Debug**. Wait for the downloading to complete.
8. Click **Go** to run the example.

5.2 Step-by-step guide for KEIL

This section shows how to use KEIL. Open KEIL as shown in this figure:

1. Open the workspace corresponding to different examples.

   For example, the host_hid_mouse_twrk22f120m_bm.uvmpw is located under the <Install_dir>/usb/example/host/hid/mouse/sdk/uv4/host_hid_mouse_twrk22f120m_bm.

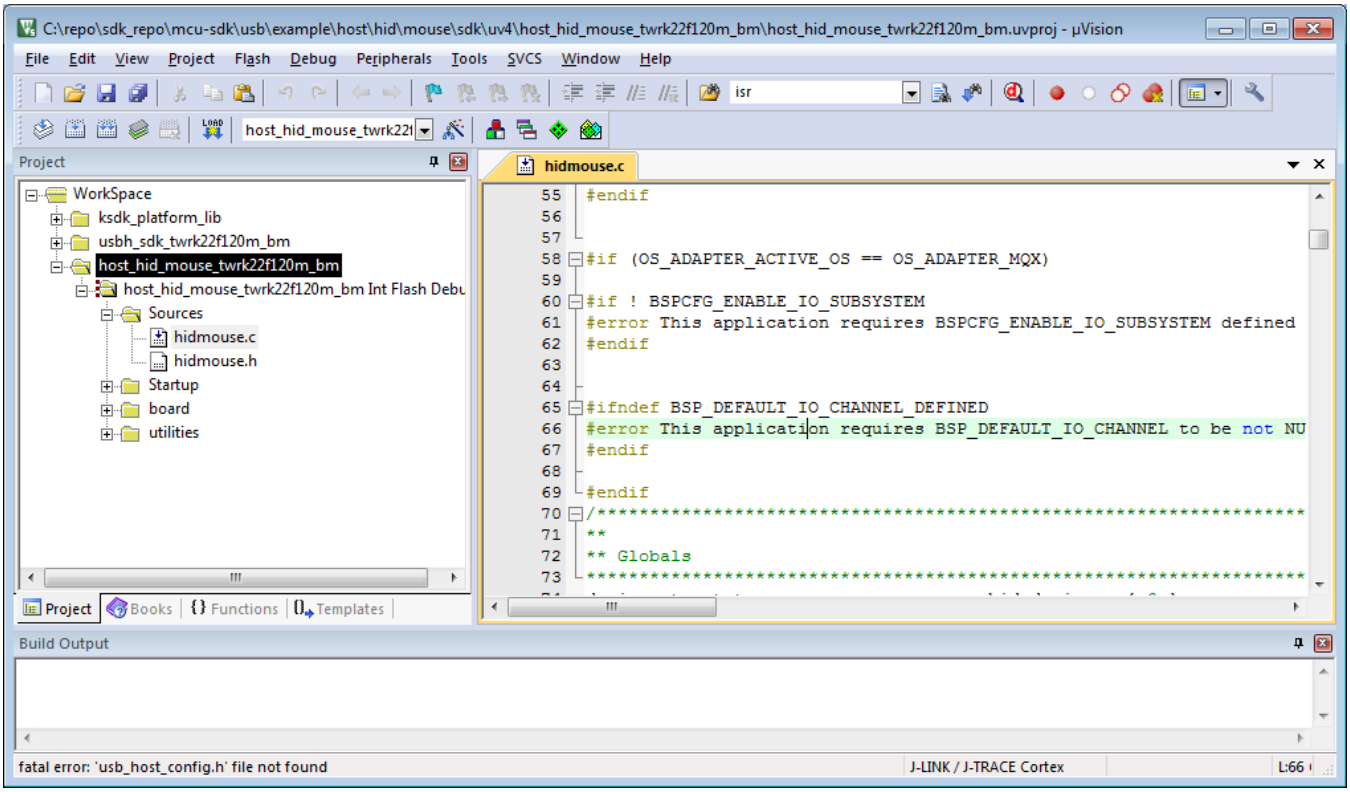

Figure-11 KEIL Workspace

2. Build the ksdk_platform_lib library.
3. Build the usbh_sdk_twrk22f120m_bm library.
4. Build the host_hid_mouse_twrk22f120m_bm example.
5. Click **Start/Stop** debug session. Wait for the downloading to complete.
6. Click **Go** to run the example.

5.3 Step-by-step guide for the Kinetis Design Studio

1. Unlike IAR or KEIL, the Kinetis Design Studio doesn't have a workspace. As a result, create a workspace and import Kinetis Design Studio USB examples, platform libraries, and the USB stack library.

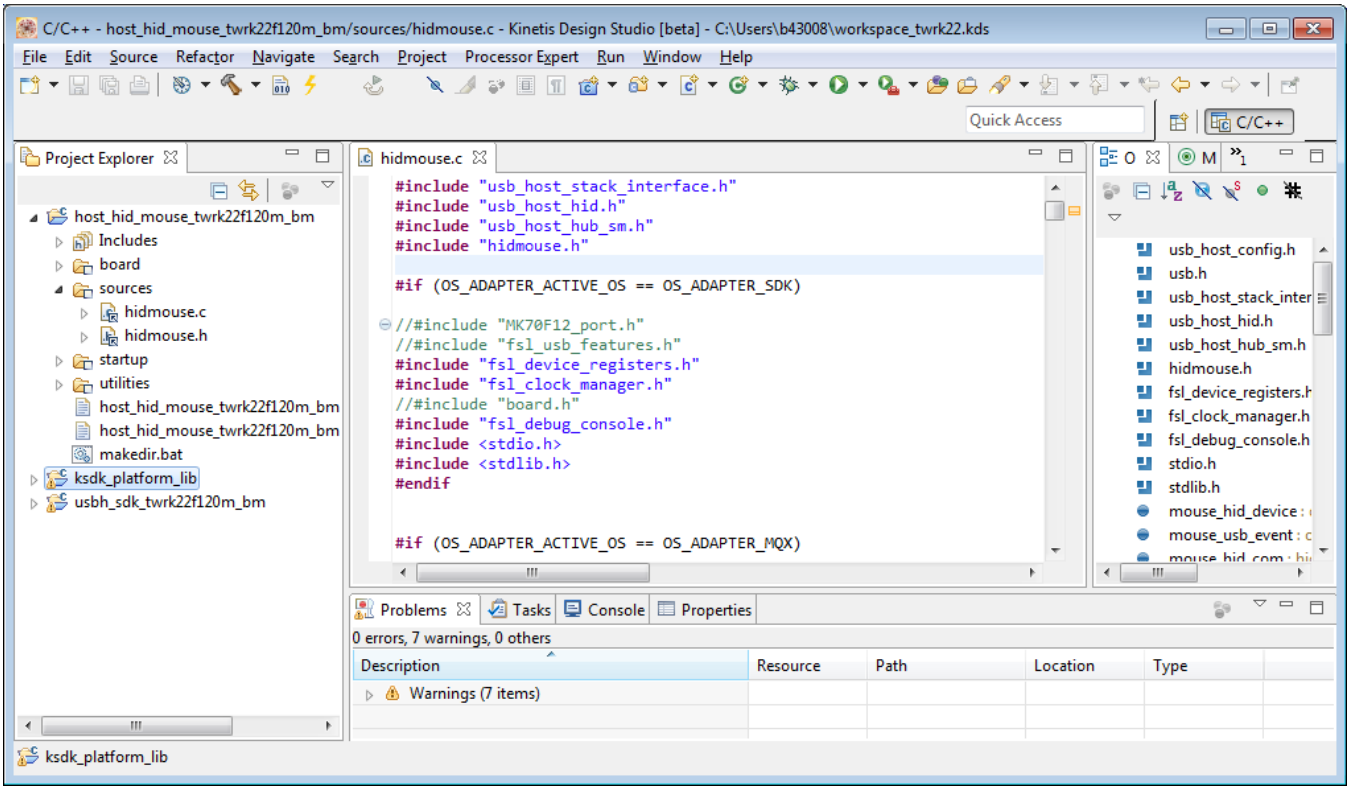

Figure-12 Kinetis Design Studio Workspace

2. Build the ksdk_platform_lib library.
3. Build the usbh_sdk_twrk22f120m_bm library.
4. Build the host_hid_mouse_twrk22f120m_bm example.
5. Select the appropriate project and the corresponding elf file and click debug.

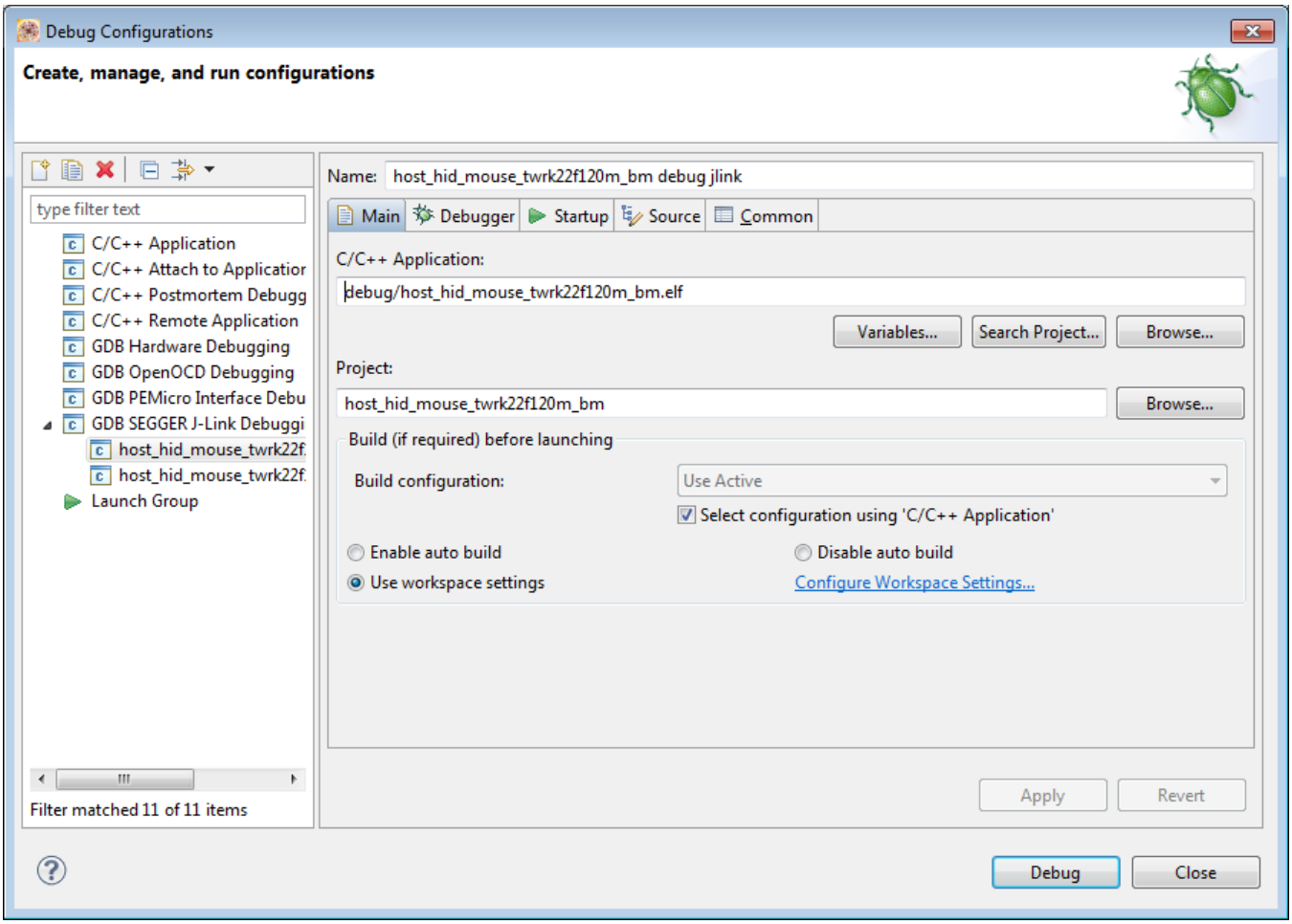

Figure-13 Kinetis Design Studio Debug configurations

6. Click **Go** to run the example.

6 USB Stack Configuration

6.1 Device configuration

All device configurations are listed in this file:

`usb_core/device/include/BOARD_NAME/usb_device_config.h`

Replace BOARD_NAME with the name of the board.

This file is used to either enable or disable the USB class driver. The object number is configurable either to decrease the memory usage or to meet specific requirements.

If the device stack configuration is changed, rebuild both the USB library and the example projects.

Note

The composite device examples works only with this setting:

```
USBCFG_DEV_COMPOSITE            1
```

All the other non-composite device examples work only with this setting:

```
USBCFG_DEV_COMPOSITE            0
```

If incorrect settings are configured, a build error occurs.

6.2 Host configuration

All the host configurations are listed in this file:

`usb_core/host/include/BOARD_NAME/usb_host_config.h`

Replace BOARD_NAME with the name of the board.

This file is used to either enable or disable the USB class driver. The object number is configurable either to decrease the memory usage or to meet specific requirements.

If the device stack configuration is changed, rebuild both the USB library and the example projects.

Note

Micro and mini receptacles are available for the TWR-K22F120M Tower System module if the TWR-SER and elevator are used. Configure the software and hardware to switch between the two USB receptacles.

- To use the micro receptacle on the TWR-K22F120M Tower System module, the jumper settings should be (for both device and host):
  - J4 1-2
  - J27 2-3 (for rev. A)
  - J27 1-2 (for rev. B)

If the host stack is used, the additional configuration is needed:

USBCFG_HOST_PORT_NATIVE 1

- To use the mini receptacle on the TWR-SER Tower System module, the jumper settings should be (for both device and host):
    - J4 1-2
    - J27 1-2 (for rev. A)
    - J27 2-3 (for rev. B)
    - See the appropriate TWR-SER user's guide for the jumper settings on TWR-SER Tower System module.

If the host stack is used, the additional configuration is needed:

USBCFG_HOST_PORT_NATIVE 0

Additional configurations are not needed for the device because switching between the two USB receptacles doesn't require changing code in the device mode.

6.3 OTG configuration

All OTG configurations are listed in these files:

```
usb_core/device/include/twrk22f120m/usb_device_config.h
usb_core/host/include/twrk22f120m/usb_host_config.h
```

These files either enable or disable the USB class driver. The object number is configurable either to decrease the memory usage or to meet specific requirements.

If the OTG stack configuration is changed, rebuild both USB library and example projects.

Notes

The OTG example for the TWR-K22F120M Tower System module requires the mini receptacle on the TWR-SER Tower System module. The jumper settings should be:

- J4 1-2
- J27 1-2 (for rev. A)
- J27 2-3 (for rev. B)
- See the appropriate TWR-SER user's guide for the jumper settings on the TWR-SER Tower System module.

The additional configuration is needed for the host mode:

```
USBCFG_HOST_PORT_NATIVE      0
```

The additional configuration is needed for the device mode:

```
USBCFG_DEV_COMPOSITE             0
```

Note

1. If the USB mini port (J14) on the serial board needs to be used as a device connector on the K64 Tower System module, J19 must be set to 2-3.

2. Because the K64_USB_DP and K64_USB_DN are not connected to the elevator micro USB port on the TWR-K64F120M Tower System module, the R522 and the R523 are not placed and only the micro USB port can be used.

3. If the TWRK-K64 Tower System module is a USB device when no OpenSDA power is supplied, the jumpers need to be set up like this:

   J29, 5-6
   J19, 2-3
   J18, 2-3.

4. If the Freescale Freedom FRDM-K64F is a USB device when no OpenSDA power is supplied, add a 0-ohm resistor on R61 to power on the P3V3_SDA.

7 Revision History

This table summarizes revisions to this document.

Revision History		
Revision number	**Date**	**Substantial changes**
1.1.0	10/2014	KSDK 1.1.0
1.0.0	7/2014	Initial release

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