Quick Start Guide

FRDM-KL25Z
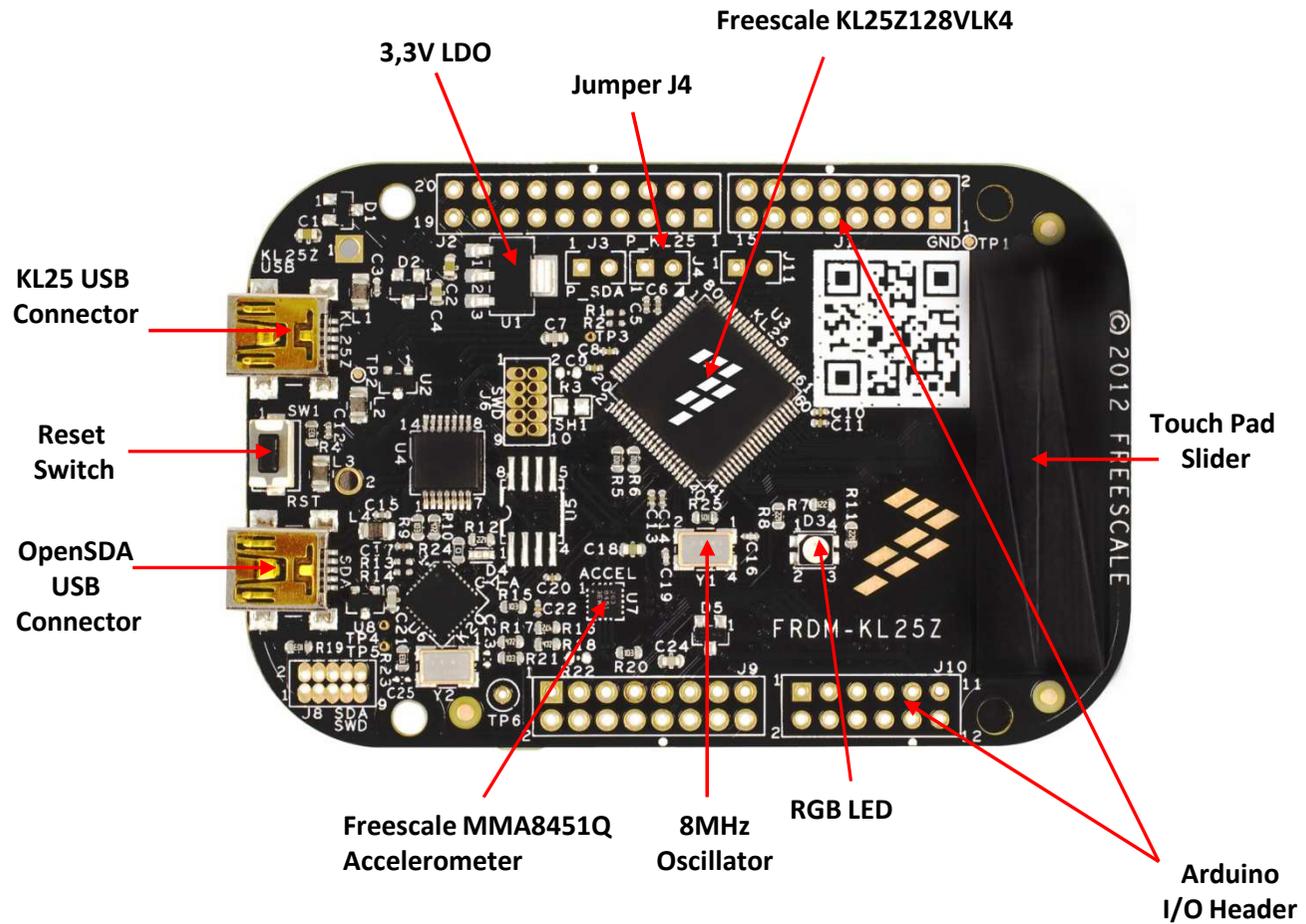
Freescale Freedom Development Platform
for the Kinetis L Series KL25 Family

freescale™

Get to know the FRDM-KL25Z

Freescale KL25Z128VLK4

3,3V LDO

Jumper J4

KL25 USB
Connector

Reset
Switch

OpenSDA
USB
Connector

Touch Pad
Slider

Freescale MMA8451Q
Accelerometer

8MHz
Oscillator

RGB LED

Arduino
I/O Header

FRDM-KL25Z Hardware Features

FRDM-KL25Z is a low-cost evaluation and development platform to demonstrate the capability of the Kinetis-L family of MCUs, ARM® Cortex™-M0+ based and targeting energy-efficient applications.

The Freescale Freedom development platform is form-factor compatible with popular third-party hardware designed to work with Arduino™ and Arduino-compatible boards, providing engineers the "freedom" to connect to a broader range of expansion boards to achieve even greater technological breakthroughs.

FRDM-KL25Z Hardware Features

- Easy access to MCU I/O with a tri-color LED
- Touch-sensing interface with a touch pad slider
- Battery-ready, low-power operation
- Power-measurement access points
- I2C to Low-g sensor
- Standard-based form factor with expansion board options
- Built-in debug interface for flash programming, run-control and monitoring

Preliminary

Step-by-Step Installation Instructions

This quick start guide is designed to provide step-by-step guidelines to get you ready to develop your applications using the FRDM-KL25Z within minutes.

1 Before connecting the hardware

1. Download and install **Windows USB Driver OpenSDA Support** from P&E Micro Systems v11_120720 or later, at http://www.pemicro.com/opensda

2. Download and extract **FRDM-KL25Z_v1.00 zip file** or later, available HERE on E14 Community

3. During manufacturing OpenSDA MSD Application was already preloaded in the board, so when you will connect for the first time FRDM-KL25Z a "**Freescale MSD USB Device**" will be detected and the right driver should automatically installed by Windows, then an "**OpenSDA – CDC Serial Port**" will be detected by Windows and might request a driver file available in the "Windows Device Driver" folder from the FRDM-KL25Z_v1.00 zip file.
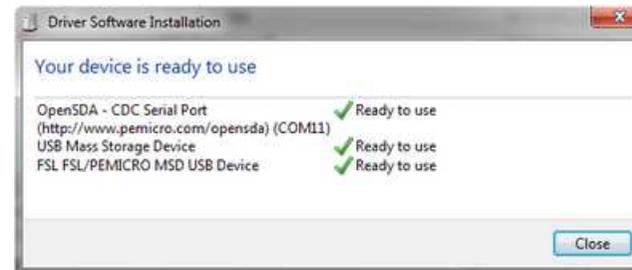
NOTE : During the installation some warning messages concerning Windows compatibility might appear, just click on "**Continue**"

2 Getting Started with OpenSDA MSD Flash Programmer

NOTE : FRDM-KL25Z were already preprogrammed in factory with OpenSDA MSD Flash Programmer application so you can move directly to step 4.

1. Enter FRDM-KL25Z in **Bootloader** mode using the following procedure:
   - Unplug the USB cable if attached
   - Press and hold the RESET/Bootloader button
   - Plug in a USB cable from a USB Host to the OpenSDA USB port
   - Release the RESET/Bootloader button
   - A new removable drive should now be visible with a volume label of "BOOTLOADER"

BOOTLOADER (F:)
968 MB free of 968 MB

3. Load the **OpenSDA MSD Flash Programmer application** using the following steps:
   - Drag/drop or copy/paste the application file MSD-FREEDOM-KL25Z.SDA available in the "SDA application" folder from the FRDM-KL25Z_v1.00 zip file to the "BOOTLOADER" drive
   - Unplug the USB cable and plug it in again
   - A new removable drive should now be visible with a volume label of "FRDM-KL25Z"

FRDM-KL25Z (E:)
127 MB free of 127 MB

4. Use the MSD Flash Programmer as below:
   - Drag/drop or copy/paste an s-record (commonly a .s19 or .srec) precompiled demo file available in the "S-RECORD project examples" folder from the FRDM-KL25Z_v1.00 zip file to the "FRDM-KL25Z" drive.
   - If programming is successful, the embedded application will begin execution automatically.
   - Unplug and re-attach the USB cable to program another embedded application.

5. List of the S-RECORD project example available and description :

- **blinky-blue.srec**
RGB LED is blinking blue

- **blinky_green.srec**
RGB LED is blinking green

- **blinky_red.srec**
RGB LED is blinking red

- **blinly_rgb.srec**
RGB LED is blinking blue, then green, then red …

- **changing_rgb.srec**
RGB LED is lighting in blue, then green, then red …

- **accelero_I2C_rgb.srec**
RGB LED changes color according to inclination detected by the accelerometer embedded in FRDM-KL25Z and connected through the I2C to the MCU

- **touch_blinky_blue.srec**
RGB LED blinking frequency is defined by the touch sensor slider

3 Getting Started with IAR Embedded Workbench for ARM

1. Download and install IAR Embedded Workbench for ARM V6.4.20 or later, 30-day evaluation license: http://www.iar.com/en/Products/IAR-Embedded-Workbench/ARM/

2. Load the OpenSDA Debug Application using the following steps:
    - Enter FRDM-KL25Z in Bootloader mode using procedure 2-1
    - Drag/drop or copy/paste the application file DEBUG-APP.SDA available in the "SDA application" folder from the FRDM-KL25Z_v1.00 zip file to the "BOOTLOADER" drive
    - Unplug the USB cable and plug it in again
    - Windows should detect three new devices including "**PeMicro OpenSDA Debug driver**" and "**OpenSDA – CDC Serial Port**" and install automatically the right driver
    - Check in Windows device manager that Jungo/PEMicro OpenSDA Debug Driver and Ports (COM & LPT)/OpenSDA-CDC Serial Port were correctly detected
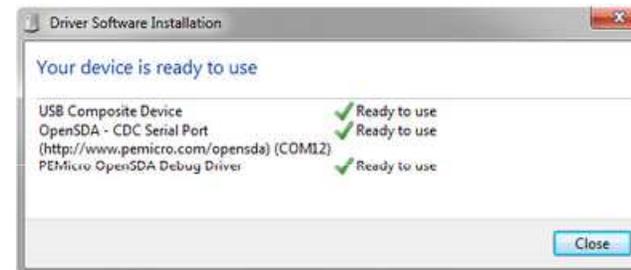
3. Patch IAR EW for ARM V6.4.20 or later, to make it compatible with OpenSDA Debug
   • Copy the content of the folder "development tool patches\IAR_patch_v110\patch"
     from the FRDM-KL25Z_v1.00 zip file in the directory [Embedded Workbench
     path]\arm\bin\

4. Run IAR EW for ARM V6.4.20 or Later and build the project

   • Run **IAR Embedded Workbench V6.4.20** or later, by selecting it from the Windows
     Start menu

   • Select File, Open and Workspace

   • Select **blinky.eww** available in the "**Project Example\build\iar\blinky**" folder from the
     FRDM-KL25Z_v1.00 zip file then **Open**

   • Right click on Blinky freedom - FLASH_128KB (top left box) then Select **Options**
       - General Options, Target, SELECT Core "Cortex-M0+"
       - C/C++ Compiler, List, DESELECT options "Output list file" & "Output assembler file"
       - Assembler, List, DESELECT option "Output list file"
       - Debugger, Setup, SELECT Driver "**PE micro**"
       - Debugger, Download, Select [...] then "**FlashKLxx128K.board**" and "**Open**"
       - PE micro / Setup, SELECT P&E Hardware Interface Type "**Tracelink - USB**"
       - PE micro / Setup, CHANGE JTAG/SWD speed value with **500kHz**, then press "**OK**"

   • Select Project then "**Clean**"

   • Select Project and "**Rebuild All**" or press ▦

NOTE : During the compilation some warning messages may appear

4. Start the Debug Environment of IAR EW for ARM V6.4.20 or later
  • Press Download and Debug
  • A PEMICRO Connection Manager window will appear,
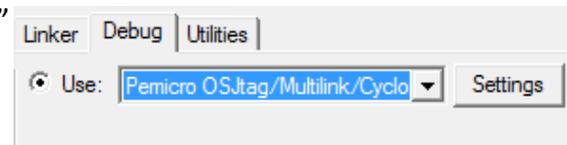   SELECT the Interface "**OpenSDA Embedded Tower Debug**" then press "**Connect (Reset)**"
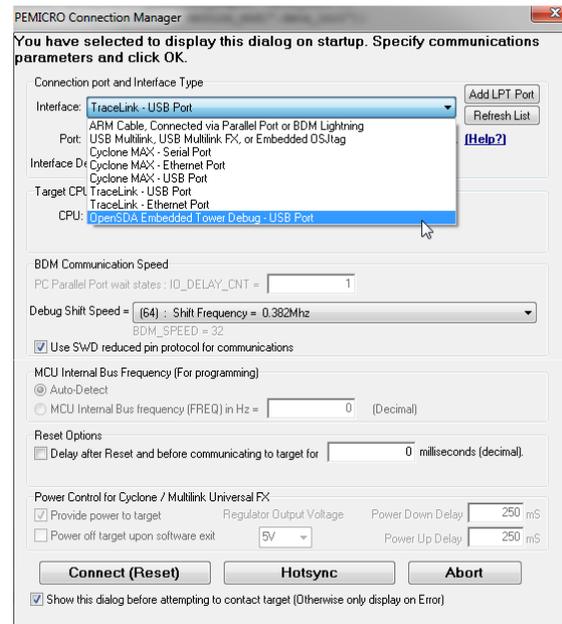
  • Start the debug session selecting Debug, Go or pressing

  • Demo of changing_rgb should start and RGB LED change of color

  • Press Break button to pause the demo
 • Press Stop Button to stop the debug session and go back to Project Edition Mode

4 Getting Started with KEIL MDK-ARM 4.54

1. Download and install Keil MDK-ARM 4.54 or later, evaluation version :
   http://www.keil.com/arm/mdk.asp

2. (Re)Install Windows USB Driver OpenSDA Support from P&E Micro Systems
   v11_120720 or later, at http://www.pemicro.com/opensda

3. Patch Keil MDK-ARM or later, to make it compatible with OpenSDA Debug
   • Copy the content of the folder "development tool patches\Keil_patch_v110\patch"
     from the FRDM-KL25Z_v1.00 zip file in the directory [Keil Install Dir]\ARM\PEMicro

4. Load the OpenSDA Debug Application
   • Follow step 3-2

5. Run Keil MDK-ARM or later and build the project
   • Run **Keil uVision4** or later, by selecting it from the Windows Start menu

   • Select Project, Open Project

   • Select **Blinky.uvproj** available in the "**Project Example\build\keil\Freedom_Blinky**" folder
     from the FRDM-KL25Z_v1.00 zip file then **Open**

   • Right click on Blinky_Freedom Project (left panel) then Select **Options for Target
     'Blinky_Freedom'**
       - Tab "Device" verify that "Freescale" "MKL25Z128xxx4" is selected
       - Tab "Output" select the option "Create HEX File" if you want to generate a precompiled
         S-record file usable with OpenSDA MSD Flash Programming demo (see step 2)

Preliminary

- Tab "Debug" select Use: "**Pemicro OSJtag/Multi** …"
  then click on "**Settings**" button
  (if you don't have Pemicro option, reinstall P&EMicro
  Windows drivers and Keil Patch)

- In the new window, select the Interface
  "**OpenSDA Embedded Tower Debug**"
  then Port USB should be detected.
  Define CPU "KL25Z128M4"
  Select "**Use SWD reduced pin protocol
  for communications**"
  Unselect "**Show this dialog before
  attempting to contact target**"
  Then press "**OK**"
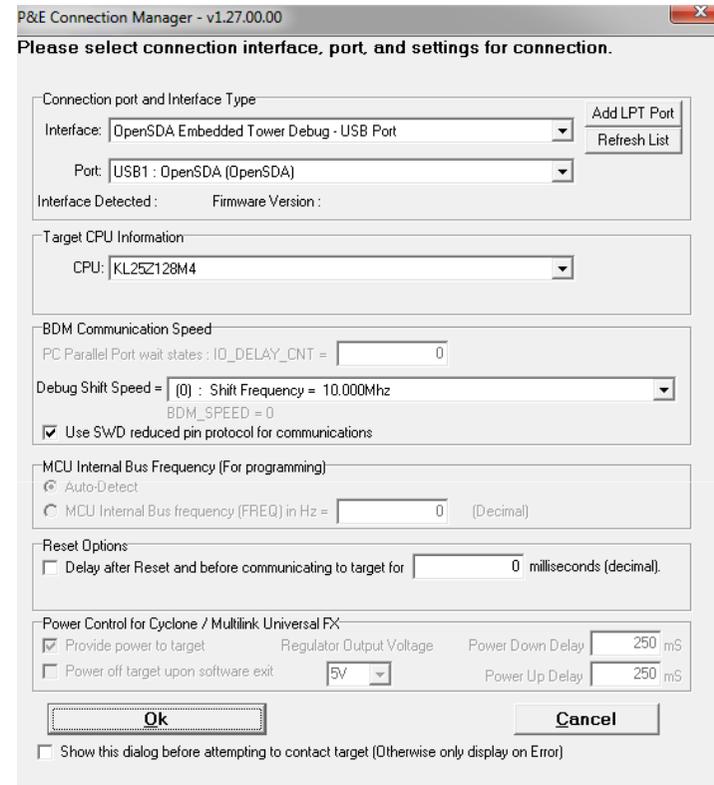
- Tab "Utilities" select Use: "**Pemicro OSJtag/Multi** …"

- Press "**OK**" button
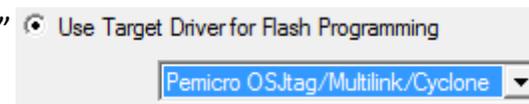
• Select "Project" then "**Clean Target**"

• Select "Project" and "**Rebuild All Target files**" or press

6. Start the Debug Environment of KEIL MDK-ARM 4.54 or later

- Press Download and Debug

- Start the debug session selecting Debug, Run or pressing

- Demo of Red Green Led Color Changing should start

- Press "Break" button to pause the demo (stop code execution)

- Press "Reset" button if you want to restart program execution since the beginning

- Press "Run" button to restart the code execution

- Press "Start/Stop" Button to leave the debug session and go back to Project Edition Mode

5 Measure real consumption from Kinetis L Series MCUs in different Low-Power Modes

1. Modify the FRDM-KL25Z hardware

WARNING : Order first a board-board connector hearder 2way, 1row, like Samtec
TSW-102-07-G-S or Molex 0022284023 with the corresponding jumper.

• On the back side of the board, cut the strap between J4 pins

• Then you need to connect a jumper on the top side between two pins J4
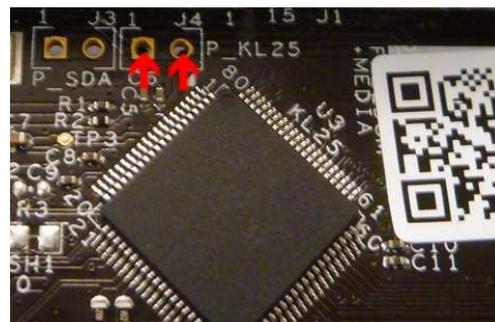
2. Load the **OpenSDA MSD Flash Programmer application** using the following steps:
- Drag/drop or copy/paste the application file MSD-FREEDOM-KL25Z.SDA available in the "SDA application" folder from the FRDM-KL25Z_v1.00 zip file to the "BOOTLOADER" drive
- Unplug the USB cable and plug it in again
- A new removable drive should now be visible with a volume label of "FRDM-KL25Z"
- Windows should detect a new device "OpenSDA – CDC Serial Port" and install automatically the right driver
- Check in Windows device manager that Ports (COM & LPT)/OpenSDA-CDC Serial Port was correctly detected and save the COM Port number.
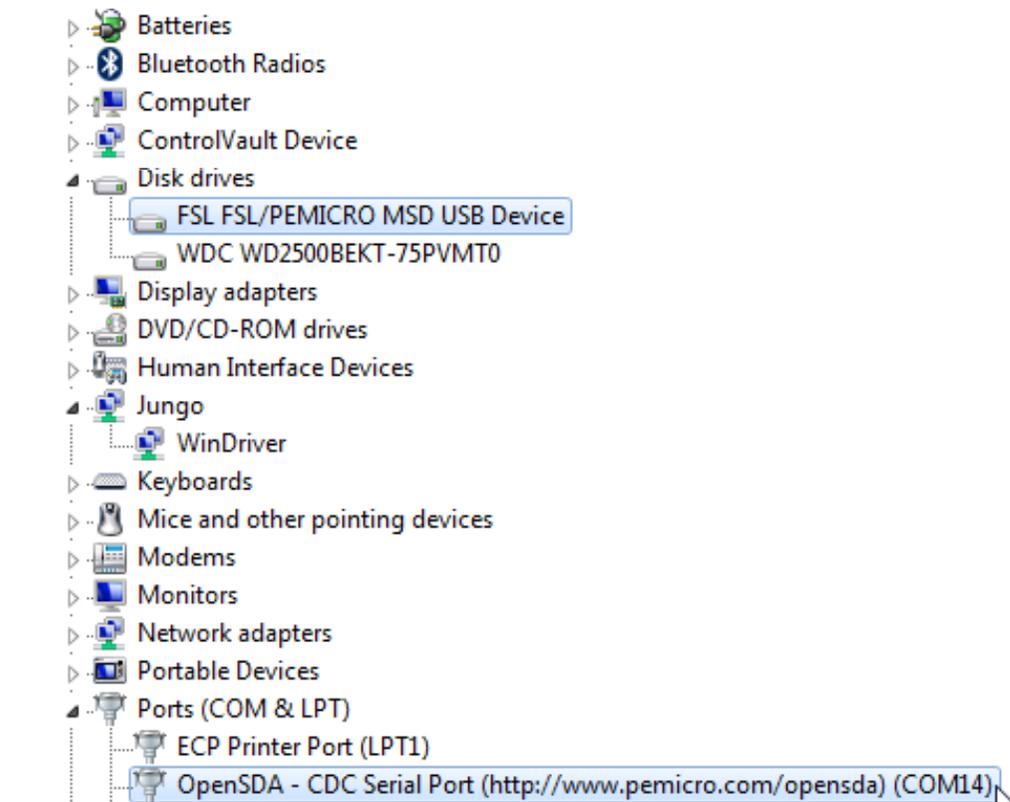
3. Drag/drop or copy/paste the s-record precompiled demo file
   low_power_demo_freedom.srec available in the "S-RECORD project
   examples" folder from the FRDM-KL25Z_v1.00 zip file to the "FRDM-KL25Z"
   drive.

4. As Windows 7 doesn't offer anymore the hyperterminal tool, you need to
   download a version of this software, like "**tera term Pro**"

5. Additional tools

   • Plug the multimeter between the two pins from J4 (top side) and select mA mode
   • Run TeraTerm Pro, by selecting it from the Windows Start menu
      - Select "Serial" option and the Port COM Number corresponding to the
        "OpenSDA – CDC Serial Port" (information available in Windows Device Manager)
      - Select "Setup", "Serial port …" and Baud Rate "19200" then "OK"
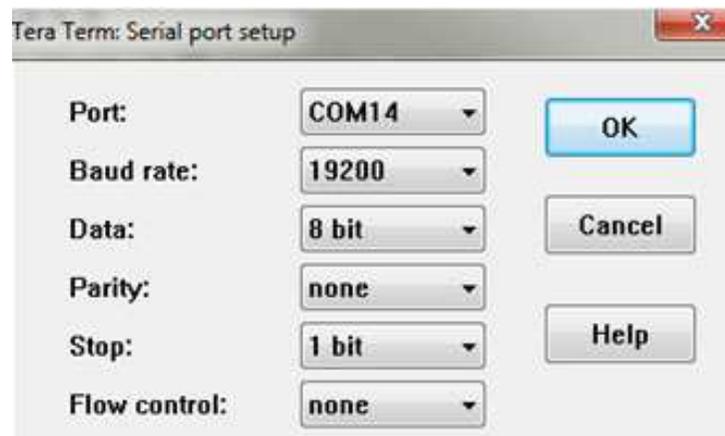
- Press the **Reset button** on FRDM-KL25Z
- Hyperterminal window will update as below

- Select a power mode (typing 0 to 9 or A to L) then press any key to confirm
- You should now measure on multimeter the real current consumption Idd from KL25 in this mode

6. To RUN another Low Power Mode
  • Press the RESET button on the Freedom board
  • Return to Hyperterminal window and Select another power mode
    (typing 0 to 9 or A to L) and press any key to confirm

EXAMPLE of measurement for :
- CASE 0: Enter VLLS0 with POR disabled (Very Low Leakage STOP 0) NO POR
- CASE 20: Enter Compute Mode run for(i=0;i<wait_count;i++)

Coming soon …

6 Getting Started with Processor Expert

7 Getting Started with CodeWarrior for Microcontroller v10.3