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Quick Start Guide for the Freescale Freedom Development Platform

FRDM-KL27Z

External Use

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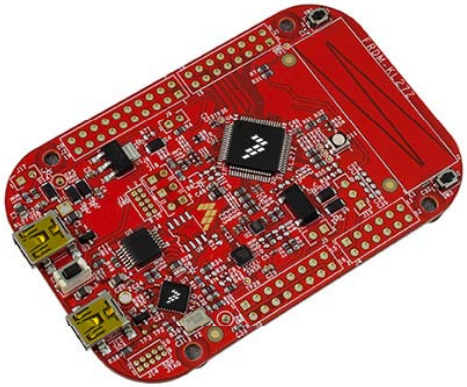


Quick Start Package Overview

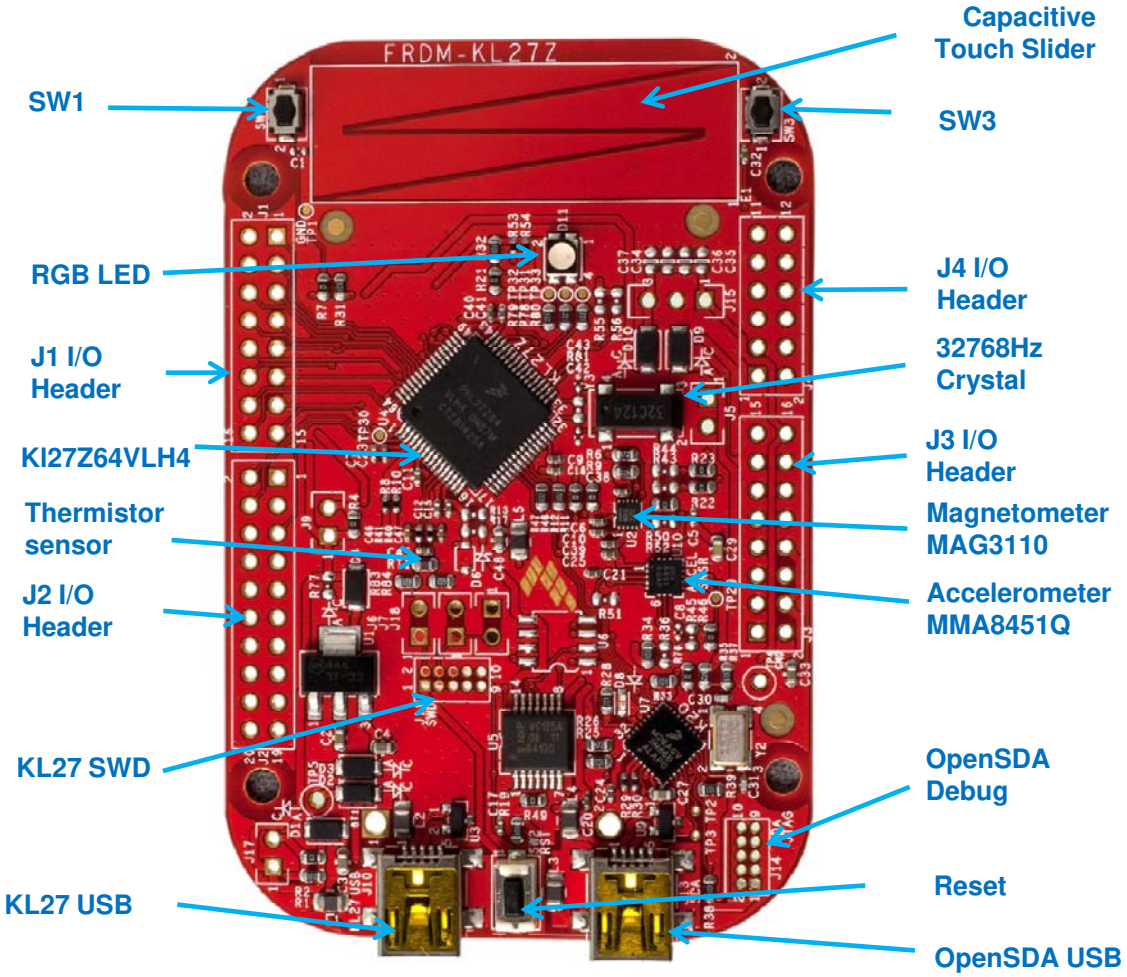
These documents are available as part of the Quick Start Package:

Name	Type	Description
Quick Start Guide	PDF	This document
OpenSDA Applications	Folder	OpenSDA Applications for the FRDM-KL27Z
Precompiled Examples	Folder	S-record images of example projects for use with the MSD Flash Programmer

Additional reference documents are available on freescale.com/FRDM-KL27Z:

Name	Description
FRDM-KL27Z Quick Start Package	Quick Start Guide and supporting files for getting started with the FRDM-KL27Z
FRDM-KL27Z User's Manual	Overview and detailed information for the FRDM-KL27Z hardware
FRDM-KL27Z Pin-outs	Spreadsheet of pin connections for all MCU pins. Includes pin out for the I/O headers, Arduino R3 compatibility chart, and OpenSDA MCU pin out.
FRDM-KL27Z Schematics	PDF schematics for the FRDM-KL27Z hardware
FRDM-KL27Z Design Package	Zip file containing all design source files for the FRDM-KL27Z hardware
OpenSDA User's Guide	Overview and instructions for use of the OpenSDA embedded debug circuit

Get to Know the FRDM-KL27Z

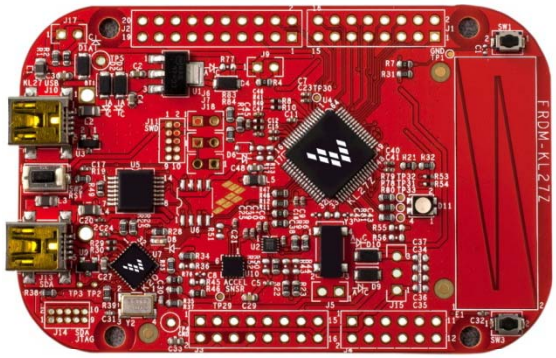


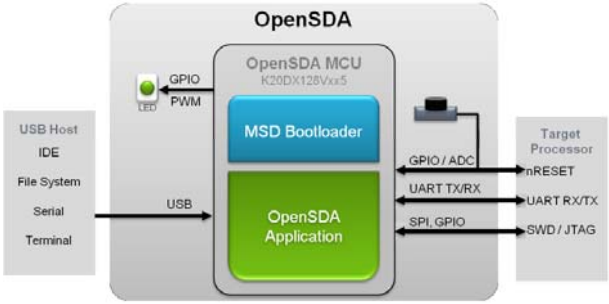
Get to Know the FRDM-KL27Z

The Freescale Freedom development platform is a set of software and hardware tools for evaluation and development. It is ideal for rapid prototyping of microcontroller-based applications. The Freescale Freedom KL27Z hardware, FRDM-KL27Z, is a simple, yet sophisticated design featuring a Kinetis L series MCU, the industry's first MCU built on the ARM® Cortex®-M0+ core.

Features:

- MKL27Z64VLH4 MCU – 48MHz, 64KB Flash, 16KB SRAM, 64LQFP
- Capacitive touch slider, accelerometer MMA8451Q, Magnetometer MAG3110, Tri-color LED,Flexible power supply options – USB, coin cell battery, external source
- Two (2) user push-button switches for NMI interrupts and LLWU wake up (SW1/SW3)
- Thermistor sensor to measuring temperature
- Easy access to MCU I/O
- Battery-ready, power-measurement access points
- Form factor compatible with Arduino ™ R3 pin layout
- New, OpenSDA debug interface
  - Mass storage device flash programming interface (default) – no tool installation required to evaluate demo apps
  - P&E Debug interface provides run-control debugging and compatibility with IDE tools
  - CMSIS-DAP interface: new ARM standard for embedded debug interface





Refer to the *FRDM-KL27Z User's Manual* and *OpenSDA User's Guide* for more information.

Getting Started Out of the Box

Installing Drivers and Running the Out of Box Demo

0 **Optional: Download and Install the P&E OpenSDA USB Drivers found at www.pemicro.com/opensda.**

1 Plug in a USB cable (not included) from a USB host to the OpenSDA mini-B USB connector. The FRDM-KL27Z will be powered by this USB connection.

FRDM-KL27Z comes with the mass-storage device (MSD) Flash Programmer OpenSDA Application pre-installed. It will appear as a removable storage drive with a volume label of FRDM-KL27Z.

The MSD Flash Programmer also includes a USB virtual serial port which requires an .INF file for proper installation in Windows. The necessary .INF file is available in the P&E OpenSDA USB Drivers (Step 0) and also on the FRDM-KL27Z removable drive.

If the USB CDC Serial Port fails to automatically install in Windows, follow the instructions in Step 2. Otherwise, skip to Step 3.

2

1. Open Device Manager
2. Locate and right-click on “OpenSDA – CDC Serial Port”
3. Select “Update Driver Software”
4. ”Browse” and select the FRDM-KL27Z drive
5. Click “Next” to complete the installation

3 The pre-installed demo running on the Kinetis KL27 MCU shows different features of the board including UART, accelerometer, RTC, TPM, thermistor sensor, etc.

Introduction to OpenSDA

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 software includes a flash-resident USB mass-storage device (MSD) bootloader and a collection of OpenSDA Applications. FRDM-KL27Z comes with the MSD Flash Programmer OpenSDA Application preinstalled. Follow these instructions to run the OpenSDA Bootloader and change the installed OpenSDA Application to P&E Debug Application that provides debugging and a virtual serial port all in one application.

Enter OpenSDA Bootloader Mode

1. Unplug the USB cable if attached.
2. Press and hold the Reset button (SW2).
3. Plug in a USB cable (not included) between a USB host and the OpenSDA USB connector (labeled “OpenSDA”). .
4. Release the Reset button.

A removable drive should now be visible in the host file system with a volume label of `BOOTLOADER`. You are now in OpenSDA Bootloader mode.

IMPORTANT NOTE: Follow the “updated an OpenSDA Application” instructions to update the OpenSDA firmware on your FRDM-KL27Z to the latest version. It is likely that the version provided in this package is newer than what was preprogrammed on your FRDM-KL27Z.

Update an OpenSDA Application

1. While in OpenSDA Bootloader mode, double-click `SDA_INFO.HTML` in the `BOOTLOADER` drive. A web browser will open the OpenSDA homepage containing the name and version of the installed Application. This information can also be read as text directly from `SDA_INFO.HTML`.
2. Locate the `OpenSDA Applications` folder in the FRDM-KL27Z Quick Start Package.
3. Copy & paste or drag & drop the MSD Flash Programmer and Debug Application (`MSD-DEBUG-FRDM-KL27Z_Pemicro_v114.SDA`) to the `BOOTLOADER` drive.
4. Unplug the USB cable and plug it in again. The new OpenSDA Application should now be running and a `FRDM-KL27Z` drive should be visible in the host file system.

You are now running the latest version of the MSD Flash Programmer and Debug.

Introduction to OpenSDA

The MSD Flash Programmer is a composite USB application that provides a virtual serial port and an easy and convenient way to program applications onto the Kinetis KL27 MCU. It emulates a FAT16 file system, appearing as a removable drive in the host file system with a volume label of FRDM-KL27Z. Raw binary and Motorola S-record files that are copied to the drive are programmed directly into the flash of the Kinetis KL27 MCU and executed automatically. The virtual serial port can be opened with standard serial terminal applications.

Using the MSD Flash Programmer

1. Locate the `Precompiled Examples` folder in the FRDM-KL27Z Quick Start Package.
2. Copy & paste or drag & drop one of the `.srec` files to the `FRDM-KL27Z` drive.

The new application should now be running on the FRDM-KL27Z. And you can program repeatedly without the need to unplug and reattach the USB cable before reprogramming.

Program rtc_func.srec example to replace the out-of-box demo on your FRDM-KL27Z.

Using the Virtual Serial Port

1. Determine the symbolic name assigned to the FRDM-KL27Z virtual serial port. In Windows open Device Manager and look for the COM port named “PEMicro/Freescale – CDC Serial Port”.
2. Open the serial terminal emulation program of your choice. Examples for Windows include Tera Term, PuTTY, and HyperTerminal.
3. Program one of the “serial test” applications from the `Precompiled Examples` folder using the MSD Flash Programmer.
4. Configure the terminal program. Most embedded examples use 8 data bits, no parity bits, and one stop bit (8-N-1). Match the baud rate to the selected serial test application and open the port.
5. Press and release the Reset button (SW2) at anytime to restart the example application. Resetting the embedded application will not affect the connection of the virtual serial port to the terminal program.

NOTE: Refer to the *OpenSDA User’s Guide* for a description of a known Windows issue when disconnecting a virtual serial port while the COM port is in use.

NOTE: Flash programming with the MSD Flash Programmer is currently only supported on Windows operating systems. However, the virtual serial port has been successfully tested on Windows, Linux and Mac operating systems.

Introduction to ROM

The Kinetis KL27 MCU supports both boot modes: boot from ROM, or boot from flash, which can be determined by external boot pin and/or programmable boot source control in flash FOPT register. In boot from ROM mode, ROM boot loader will be active, which is a build-in firmware upgrade program in ROM, supporting USB,UART,I2C,SPI interfaces, and can be used as ISP and IAP. By default, it is boot from ROM for blank devices, but for Freescale Freedom board, it is determined by external boot pin (NMI).

Enter ROM Boot Loader Mode

1. Unplug the USB cable if attached.
2. Press and hold the NMI button (SW1).
3. Plug in a USB cable (not included) between a USB host and the OpenSDA USB connector (labeled “OpenSDA”). .
4. Now, the Kinetis KL27 MCU has entered into ROM bootloader mode. You can select using USB, or UART, or I2C,or SPI interface to setup connection with FRDM-KL27Z.

Using ROM Boot Loader

1. Click here to download PC tools blhost.
2. Follow KBLHOSTUG (Kinetis blhost User's Guide) to setup connection by UART interface.
3. Run “FlashEraseAllUnsecure” command to make mass erase.
4. Locate the Quick Start Package to get .bin firmware for upgrade.
5. Run “WriteMemory” command to program bin file to flash by blhost tools, and then run “execute” command.

The new application should now be running on the FRDM-KL27Z. And you repeatedly perform above step 3 to 5 to program other firmware.

Explore Further

Now that you are familiar with the FRDM-KL27Z and OpenSDA, it's time to explore the additional software and lab guides available on www.freescale.com/FRDM-KL27Z. Select your next path from the links in the **Jump Start Your Design section.**

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