UM11890

KITPF5300FRDMEVM evaluation board

Rev. 1 — 5 June 2023 User manual

Document Information

Information	Content
Keywords	Safety, SBC, automotive, low power, ASIL D, industrial
Abstract	This document is the user guide for the KITPF5300FRDMEVM evaluation board.

Revision history

Rev	Date	Description
v.1	20230605	Initial version

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1 Introduction

This document is the user guide for the KITPF5300FRDMEVM evaluation board. It is intended for engineers involved in the evaluation, design, implementation, and validation of the PF5300.

This document covers connecting the hardware, installing the software and tools, configuring the environment, and using the kit.

2 Finding kit resources and information on the NXP website

NXP Semiconductors provides online resources for this evaluation board and its supported device(s) on http://www.nxp.com.

The information page for the KITPF5300FRDMEM evaluation board is at http://www.nxp.com/KITPF5300FRDMEVM. The information page provides overview information, documentation, software and tools, parametrics, ordering information and a **Getting Started** tab. The **Getting Started** tab provides quick-reference information applicable to using the KITPF5300FRDMEVM evaluation board, including the downloadable assets referenced in this document.

3 Getting ready

Working with the KITPF5300FRDMEVM requires the kit contents, additional hardware, and a Windows PC workstation with installed software.

3.1 Kit contents

- Assembled and tested evaluation board and preprogrammed FRDM-KL25Z microcontroller
- 3.0 ft USB-STD A to USB-B-mini cable
- Jumpers mounted on board

3.2 Additional hardware

In addition to the kit contents, the following hardware is necessary or beneficial when working with this kit.

- Power supply with a range of 3.3 V to 5.0 V

3.3 Minimum system requirements

This evaluation board requires a Windows PC workstation. Meeting these minimum specifications should produce great results when working with this evaluation board.

- USB-enabled computer with Windows 7 or Windows 10

3.4 Software

The software listed here must be installed before working with this evaluation board.

- NXP GUI installation package

4 Getting to know the hardware

The KITPF5300FRDMEVM provides flexibility to explore all the features of the device and make measurements on the main part of the application. The FRDM-KL25Z microcontroller connected to the board, combined with the NXP GUI software, allows full configuration and control of the PF5300.

4.1 Board features

- VIN and PVIN connectors
- SW1 output capability up to 15 A
- Load slammer connector
- PGOOD output
- Emulation mode capabilities
- USB connection and GUI for register access, OTP emulation, and programming

4.2 Kit featured components

Figure 1 identifies important components on the board and Table 1 provides additional details about these components.

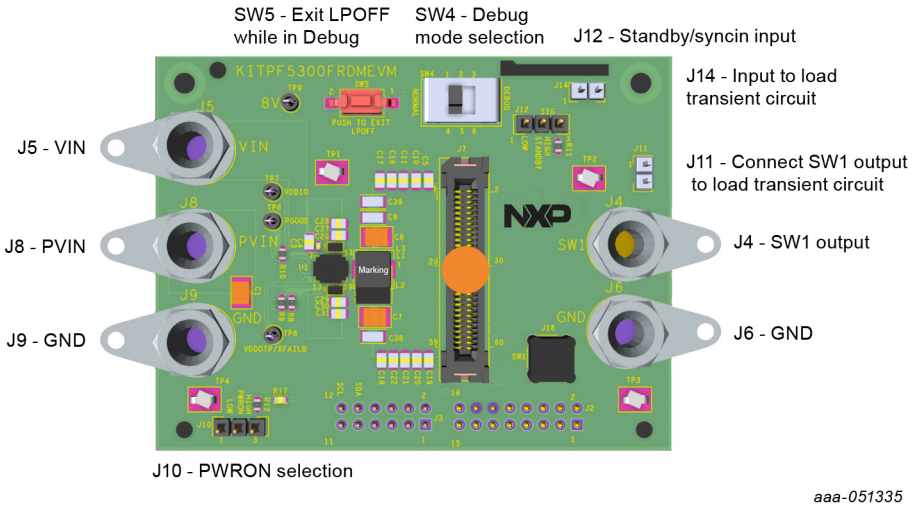


Figure 1. Evaluation board featured component locations on top

Table 1. Connector and jumper descriptions

Position	Function	Description
J5	VIN	Gate drive and core supply input (up to 5 V)
J8	PVIN	Power conversion path input voltage (up to 5 V)
J9, J6	GND	Ground
J12	STANDBY	1-2: STANDBY = GND (Default) 2-3: STANDBY = VDDIO
J10	PWRON	1-2: PWRON = GND (Default) 2-3: PWRON = VDDIO
J11	Load transient enable	Short: connects SW1 output to load transient circuit
J14	Load transient pulse	Pin 1: ground Pin 2: apply pulse from function generator to generate transient load
J7	Load slammer connector	Connect load slammer tool, if available, for transient generation
J4	Output voltage	Output voltage
J16	Vout sense	SMB connector for accurate sense of output voltage

4.3 Schematic, board layout, and bill of materials

The schematic, board layout, and bill of materials for the KITPF5300FRDMEVM evaluation board are available at http://www.nxp.com/KITPF5300FRDMEVM.

5 Installing and configuring software tools

5.1 Flashing or updating the GUI firmware

The KITPF5300FRDMEVM is always delivered with the GUI firmware already flashed. If the MCU firmware is already flashed, the user can ignore this section. If it is specified that the user needs to update the firmware or if the firmware is malfunctioning, follow these instructions:

5.1.1 Flashing KITPF5300FRDMEVM evaluation board firmware for Windows 7

Steps 1 and 2 are not required if **BOOTLOADER** is already loaded in the KITPF5300FRDMEVM board. In that case, start from step 3.

1. Press the RST pushbutton and connect the USB cable into the SDA port on the KITPF5300FRDMEVM board
   - A new **BOOTLOADER** device should appear on the left pane of the Windows Explorer
2. Drag and drop the file *MSD-DEBUG-FRDM-KL25Z_Pemicro_v118.SDA* into the **BOOTLOADER** drive
   Note: *Make sure to allow enough time for the firmware to be saved in the* ***BOOTLOADER***
3. Disconnect and reconnect the USB cable into the SDA port
   - This time, without pressing the **RST** button, the FRDM_KL25Z device should appear on the left pane of the Windows Explorer as pictured in Figure 2.

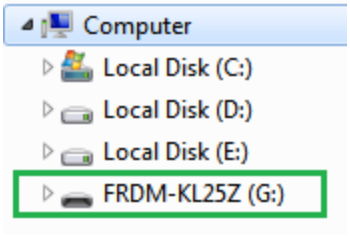
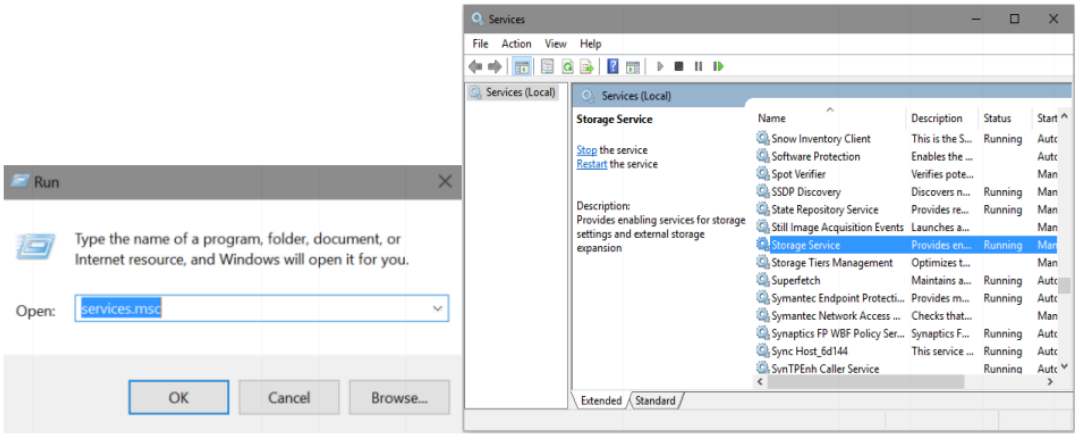


Figure 2. Left pane of Windows Explorer

4. Locate the file *nxp-gui-fw-frdmkl25z-usb_hid-pf5300_v0.3.bin* (or later version) from the package, and drag and drop the file into the FRDM_KL25Z device.
   Note: *Make sure to allow enough time for the firmware to be saved*
5. The KITPF5300FRDMEVM evaluation board firmware is successfully loaded. Disconnect and reconnect the USB cable o the KL25Z USB port.

5.1.2 Flashing KITPF5300FRDMEVM evaluation board firmware for Windows 10

1. Disable the storage services: Run the **Services**, double click on **Storage Service** from the resulting list, and press the **stop** button.



Steps 2 and 3 are not required if **BOOTLOADER** is already loaded in the KITPF5300FRDMEVM board. In that case, start from step 4.

2. Press the **RST** button and connect the USB cable to the SDA port on the KITPF5300FRDMEVM board.
   - A new **BOOTLOADER** device appears on the left pane of the File explorer.
3. Drag and drop the file *MSD-DEBUG-FRDM-KL25Z_Pemicro_v118.SDA* into the **BOOTLOADER** drive.
   Note: *Make sure to allow enough time for the firmware to be saved in the* ***BOOTLOADER****.*
4. Disconnect and reconnect the USB cable to the SDA port.
   - This time without pressing the RST button, the FRDM_KL25Z device should appear on the left pane of the Windows File Explorer as pictured in Figure 3.

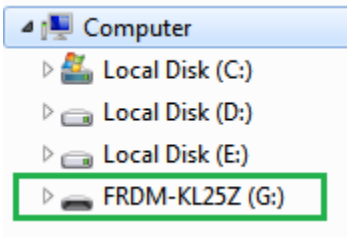
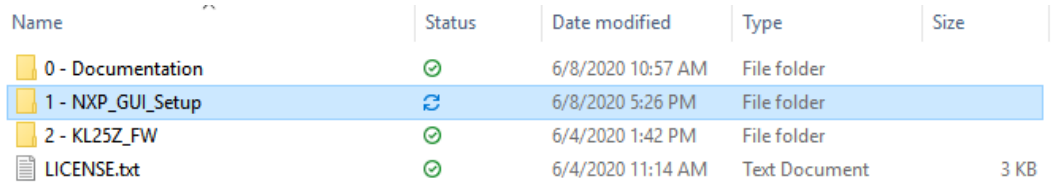


Figure 3. Left pane of Windows File Explorer

5. Locate the file *nxp-gui-fw-frdmkl25z-usb_hid-pf5300_v0.3* (or later version) from the package, and drag and drop the file into the FRDM_KL25Z device.
   Note: *Make sure to allow enough time for the firmware to be saved.*
6. The KITPF5300FRDMEVM board firmware is successfully loaded. Disconnect and reconnect the USB cable to the FRDM-KL25Z microcontroller USB port.

5.2 Installing the GUI software package

To install the PF5300 NXP GUI, download or obtain the NXPGUI package, unzip, and open the **1-NXP_GUI_Setup** folder:



Double click on the setup file and follow the instructions.

When the installation is complete, search for the **NXPGUI** application from the Windows search bar, then click on the result to launch the GUI.

6 PF5300 NXP GUI

Once the kit is ready and the **NXPGUI** software is installed, use the Windows search bar to find the GUI. Click the search result to launch it.

Once the NXP GUI is opened and the kit selection window shown in Figure 4 is displayed, check for the following settings and click **OK.**

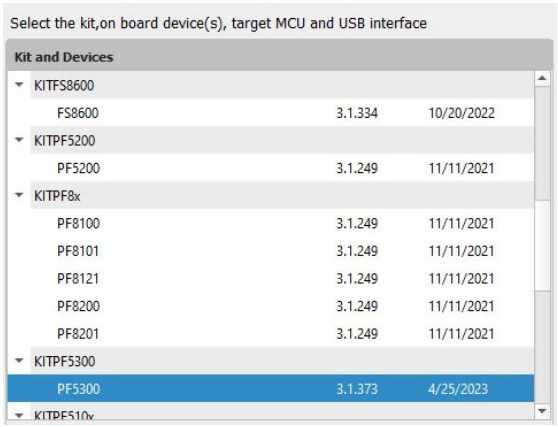


Figure 4. NXP GUI kit selection window

Note: *To avoid the kit selection window on every launch, check the box* ***Use this configuration and do not ask again***

The window shown in Figure 5 opens.

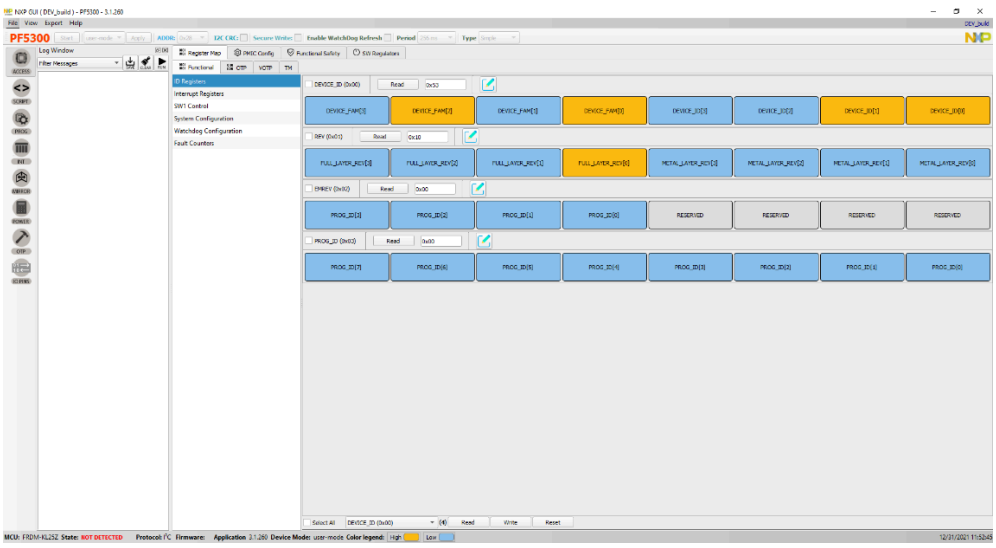


Figure 5. NXP GUI

7 Configuring the hardware

Once the user has installed the NXP GUI, follow these instructions to quickly power up the board.

Powering up the board with pre-programmed OTP configuration

1. Make sure that the board has the right jumper configuration per Table 1 and Figure 6.
2. Ensure that SW4 is in the NORMAL position.
3. Verify that the FRDM-KL25Z microcontroller is plugged in, and the USB cable on the FRDM-KL25Z microcontroller USB connector side is attached. It is important that the USB cable is connected to a PC, because the cable enables communication with the NXP GUI and provides the VDDIO reference for the IC.
4. Apply VIN and PVIN with PWRON = 0.
5. Move J10 from 1-2 to 2-3 to turn on the PF53.
6. Open the GUI and communicate as required.

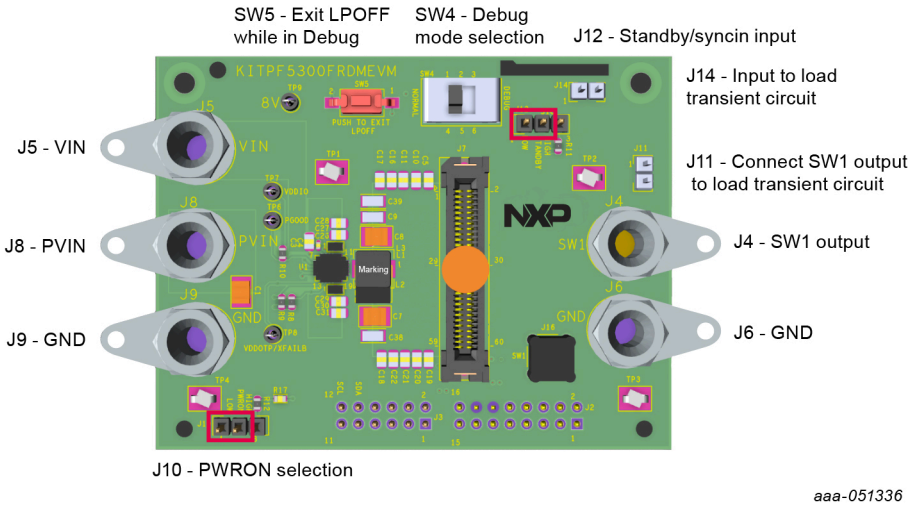
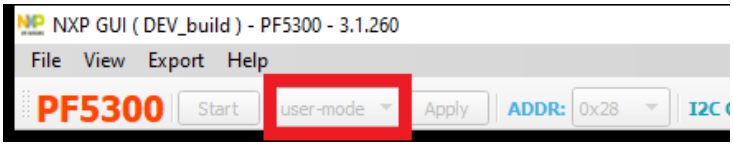


Figure 6. Jumpers

Powering up the board in Debug mode

Debug mode allows the user to modify OTP mirror registers before powering up. This facilitates exercising different features of the PF5300 while deciding on the best configuration for a given application.

1. Remove VIN and PVIN.
2. Open J10.
3. Move SW4 to the DEBUG position.
4. Apply 8 V to TP9, which is identified with the silkscreen "8V".
5. Apply VIN and PVIN. Now the device powers up internally to the LP_OFF state.
6. Open the NXP GUI, and select **Test Mode** in the top left dropdown box.



1. Go to the **Mirror** tab and modify the mirror registers as desired. It may be easier to **Read All** the mirror registers before modifying, to reduce the number of registers that must be changed.
2. Press the SW5 button to power up the PF5300 with the selected configuration.

3. Even after power up, the device continues to be in Debug mode. The user can continue modifying the mirror registers on the fly to see their impact. This may be useful while trying to optimize compensation or AVP performance of the part.

Using the transient load circuit in the evaluation board

The KITPF5300FRDMEVM has a provision for a commercially available *load slammer* tool that allows high di/dt transient load testing. Users who do not have such a tool can use the circuit shown in Figure 7 to perform simple transient testing on the board.

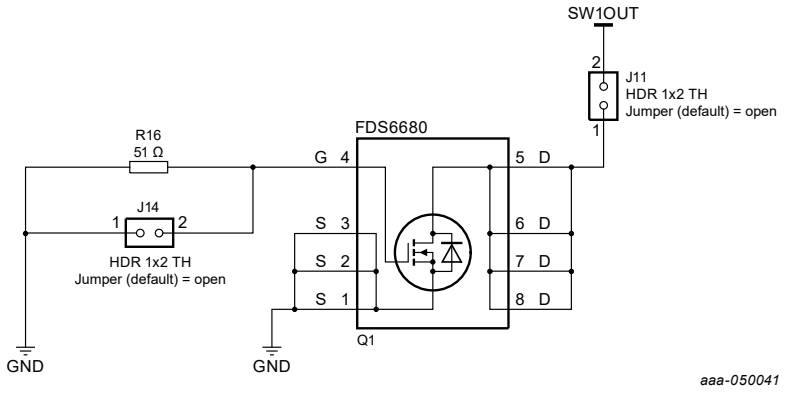


Figure 7. Circuit for simple transient testing

The circuit works by applying a controlled gate voltage on J14. Depending on the amplitude and slope of the signal applied, the amplitude and slope of the transient load can be adjusted.

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