UM11162

KITPF8200FRDMPGM programming board

Rev. 2.0 — 6 January 2026 User guide

Document information

Information	Content
Keywords	PF82, ASIL B, OTP, watchdog, PGOOD, Standby
Abstract	This is the user guide for the KITPF8200FRDMPGM programming board. This document is intended for engineers involved in the evaluation, design, implementation, and validation of the PF81/82 multi-channel power management integrated circuit.

1 Introduction

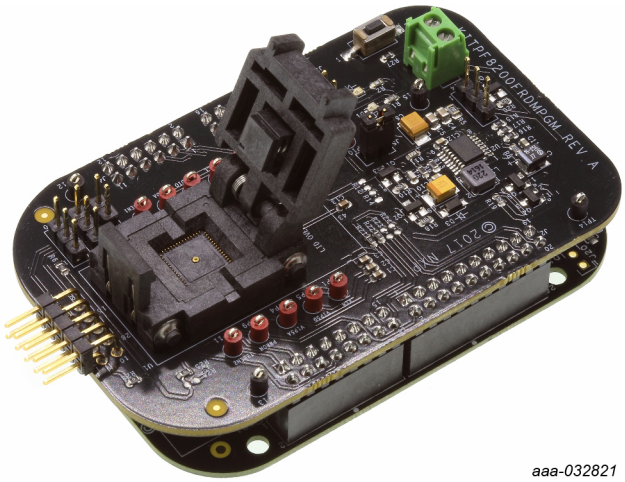


Figure 1. KITPF8200FRDMPGM

This is the user guide for the KITPF8200FRDMPGM programming board. This document is intended for engineers involved in the evaluation, design, implementation, and validation of PF81/82 multi-channel power management integrated circuit.

The scope of this document is to provide the user with information to program the PF81/82 multi-channel power management integrated circuit. This document covers connecting the hardware, installing the software and tools, configuring the environment, and using the kit.

KITPF8200FRDMPGM can only be used to support samples programming, not production use cases. If a customer has a large-volume OTP programming requirement, they must contact a distributor or third party which has been qualified to perform the operation.

Table 1. Device support

PMIC device	Qualification level	Link
PF8100/PF8200	Automotive/Industrial	http://www.nxp.com/PF81-PF82
PF8101/PF8201	Automotive/Industrial	http://www.nxp.com/PF81-PF82
PF8150/PF8250	Automotive	http://www.nxp.com/PF81-PF82
PF8150/PF8250	Industrial/Consumer	http://www.nxp.com/PF81-PF82
PF8121	Consumer	http://www.nxp.com/PF8121

2 Finding kit resources and information on the NXP web site

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

The information page for the KITPF8200FRDMPGM programming board is at https://www.nxp.com/KITPF8200FRDMPGM. The information page provides overview information, specifications, ordering information, documentation, and software. The **Documents and Software** tab provides quick-reference information applicable to using the KITPF8200FRDMPGM programming board, including the downloadable assets referenced in this document.

2.1 Collaborate in the NXP community

The NXP community is for sharing ideas and tips, asking and answering technical questions, and receiving input on just about any embedded design topic.

The NXP community is at http://community.nxp.com.

3 Getting ready

Working with the KITPF8200FRDMPGM requires the kit contents and a Windows PC workstation with installed software.

3.1 Kit contents

- Assembled and tested KITPF8200FRDMPGM and preprogrammed FRDM-KL25Z microcontroller board in an anti-static bag
- 3.0 ft. USB-STD A to USB-B-mini cable – this depends on the FRDM-KL25Z board version
- Quick Start Guide

3.2 Windows PC workstation

This programming board requires a Windows PC workstation with the following specifications

- USB-enabled computer with Windows 7 to 11

3.3 Software

Software must be installed before working with this programming board.

There is one universal GUI for NXP's Automotive PMIC products, which can be found at https://www.nxp.com/design/design-center/software/analog-expert-software-and-tools/nxp-gui-for-automotive-pmic-families:PMIC-GUI-SW

Download and install this GUI from the NXP website. The programming board can be operated to program PF82 family devices using this GUI. An example is provided in this document using Rev 10.0.

One set of PF82 firmware can be found in the GUI folder. The FRDM_KL25Z on the KITPF8200FRDMPGM may need to be updated with this version. See Section 5 for more information.

4 Getting to know the hardware

The NXP OTP programming boards provide an easy-to-use platform for programming the default configuration of the NXP PF81/82 power management products. The boards support all voltages and signals needed for OTP programming.

4.1 Kit overview

The KITPF8200FRDMPGM is a programming board featuring a 56-pin QFN socket compatible with all PF81/82 PMICs. The kit integrates all hardware needed to program the OTP registers in the PMIC.

It integrates a communication bridge based on the FRDM-KL25Z freedom board to communicate with the GUI software interface to program the OTP configuration.

4.1.1 KITPF8200FRDMPGM features

Programming socket

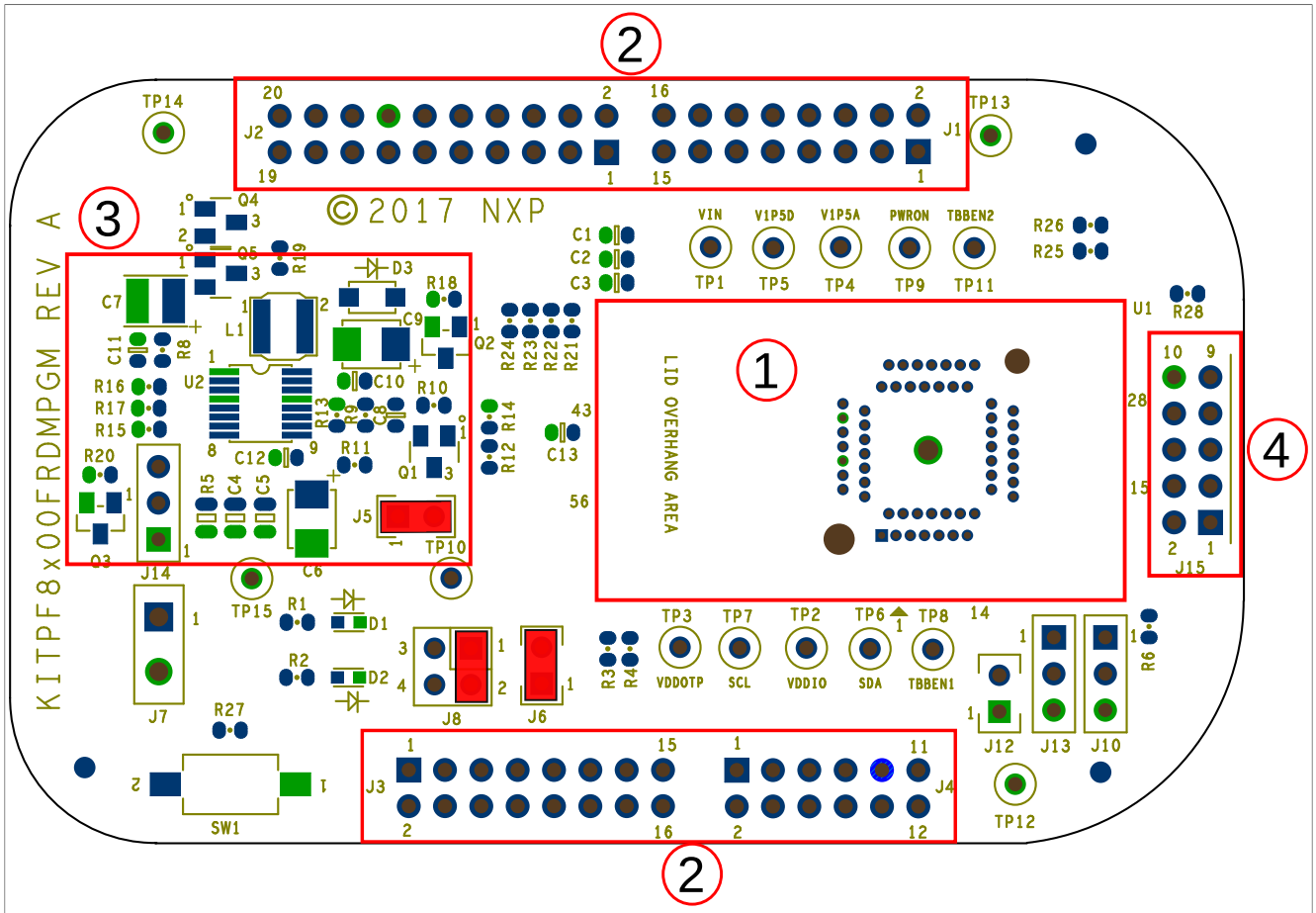
- Clamshell 56-pin QFN socket

System features

- 5.0 V operating input voltage range (from USB connector)
- Integrated boost converted to supply VDDOTP programming voltage
- USB to I^2C communication via the FRDM-KL25Z interface
- Inline programming interface connector

4.2 Kit featured components

Figure 2 identifies important components on the KITPF8200FRDMPGM board.



1. QFN 56-pin socket
2. Freedom board interface connectors
3. 7.5 V Boost converter
4. Inline programming connector

Figure 2. KITPF8200FRDMPGM featured component locations

4.2.1 Supported PMICs

The PF81/82 family of devices feature power management integrated circuits (PMICs) designed for high-performance i.MX 8 and S32V based applications, and also many non-NXP processors. It features various devices with multiple high-efficiency buck converters with the ability to operate in single or multiphase configuration, as well as various linear regulators with selectable switch mode configuration.

Built-in one time programmable memory stores key startup configurations, drastically reducing the number of external components typically used to set output voltage and sequence of external regulators. Regulator parameters are adjustable through high-speed I^2C after startup, offering flexibility for different system states.

The PF81/82 family comprises multiple devices to address different market needs:

- **PF8200** is the flagship version of this family, providing a full-feature PMIC with seven switching regulators and four LDOs, integrating functional safety mechanisms to comply with the ISO 26262 standard and providing a powerful and flexible solution for ASIL B(D) automotive modules.
- **PF8100** is the non-safety version of the higher-end device. It features seven switching regulators and four LDOs, providing all the power management and digital control included in PF8200 without the functional

safety overhead to provide a more economic platform for systems not required to meet the ASIL B qualification.

- **PF8121** is the consumer version of the higher-end device. It features seven switching regulators and four LDOs, providing the same power management and digital control with a standard consumer qualification rating to address a more cost-effective platform for consumer applications.
- **PF8201** is a reduced version of this PMIC, featuring five switching regulators and three LDOs, integrating functional safety mechanisms to comply with the ISO 26262 standard, and providing a powerful and flexible solution for lower-end ASIL B(D) automotive modules.
- **PF8101** is the non-safety version of the PF8201 device. It features five switching regulators and three LDOs, providing power management and digital control for lower-end applications without the functional safety overhead to provide a more economic platform for systems not required to meet the ASIL B qualification.
- **PF8250** is the BCD+ technology PMIC which is compatible to PF8200. Nearly all of its functionality is the same as PF8200 and they are physically compatible, pin-to-pin. The detailed differences between the two devices can be found on the website.
- **PF8150** is the BCD+ technology PMIC which is compatible with PF8100 in the same way that PF8250 can replace PF8200. PF8150 has automotive and industrial/consumer versions. There is no difference in the two versions with respect to OTP programming.

All devices provide pin-to-pin compatibility on a small profile 8 x 8 mm, 56-pin QFN package compatible with the clamshell socket featured in the KITPF8200FRDMPGM.

4.3 Schematic, board layout and bill of materials

The board layout and bill of material for the KITPF8200FRDMPGM are available at https://www.nxp.com/KITPF8200FRDMPGM.

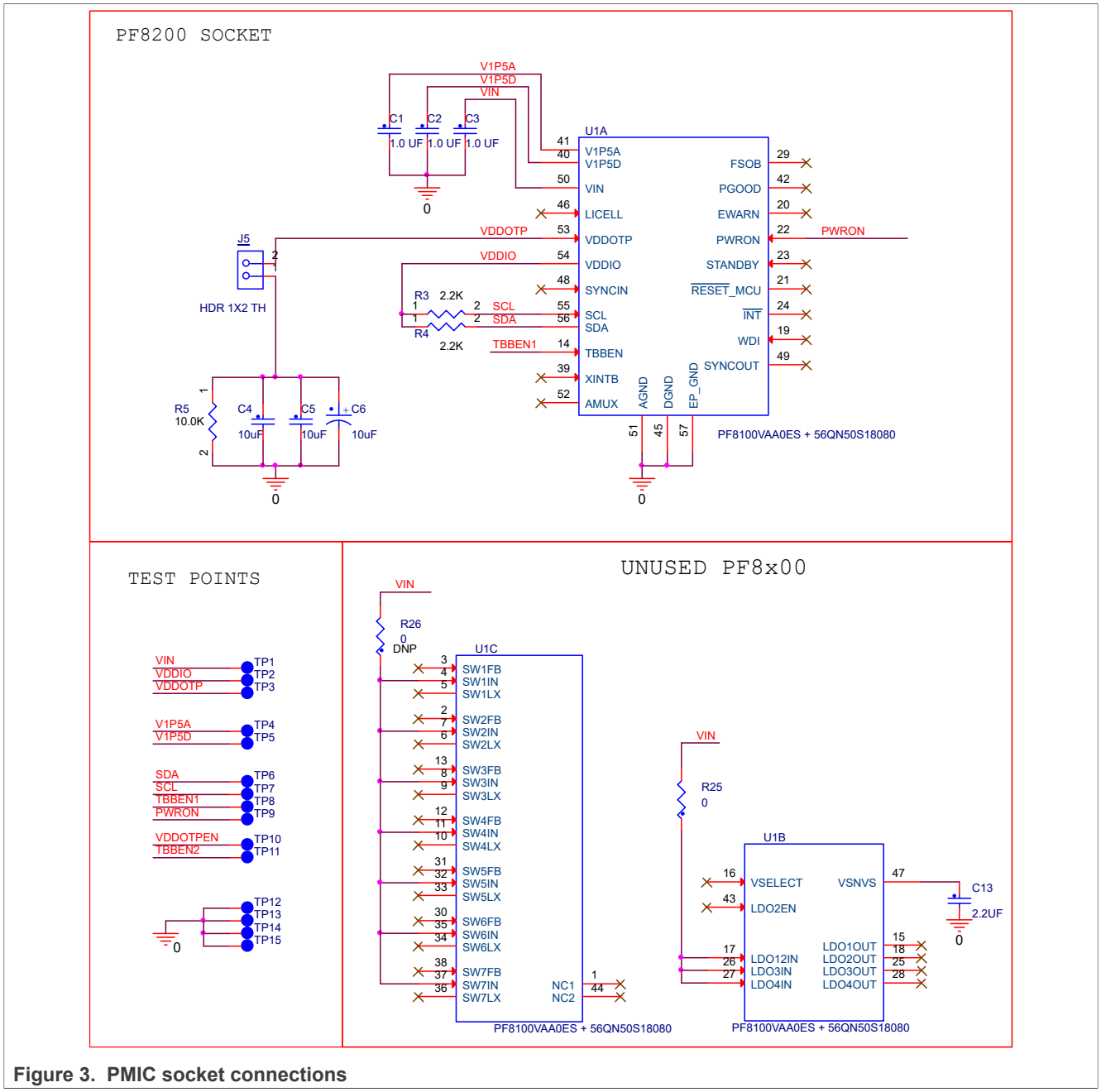


Figure 3. PMIC socket connections

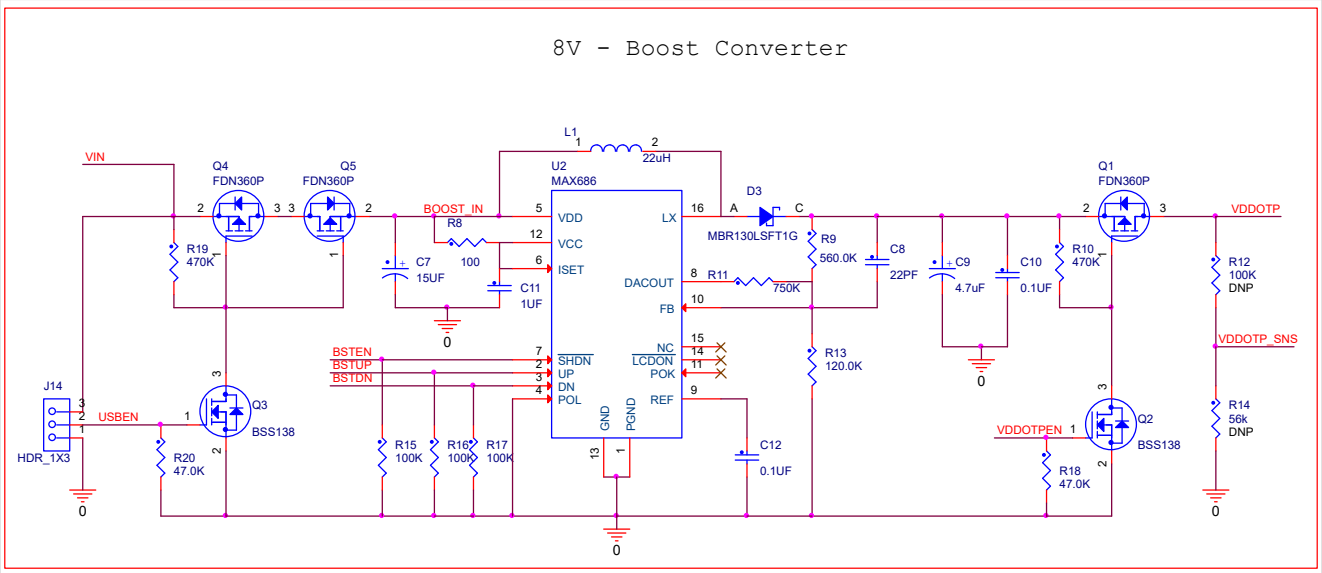


Figure 4. VDDOTP boost converter

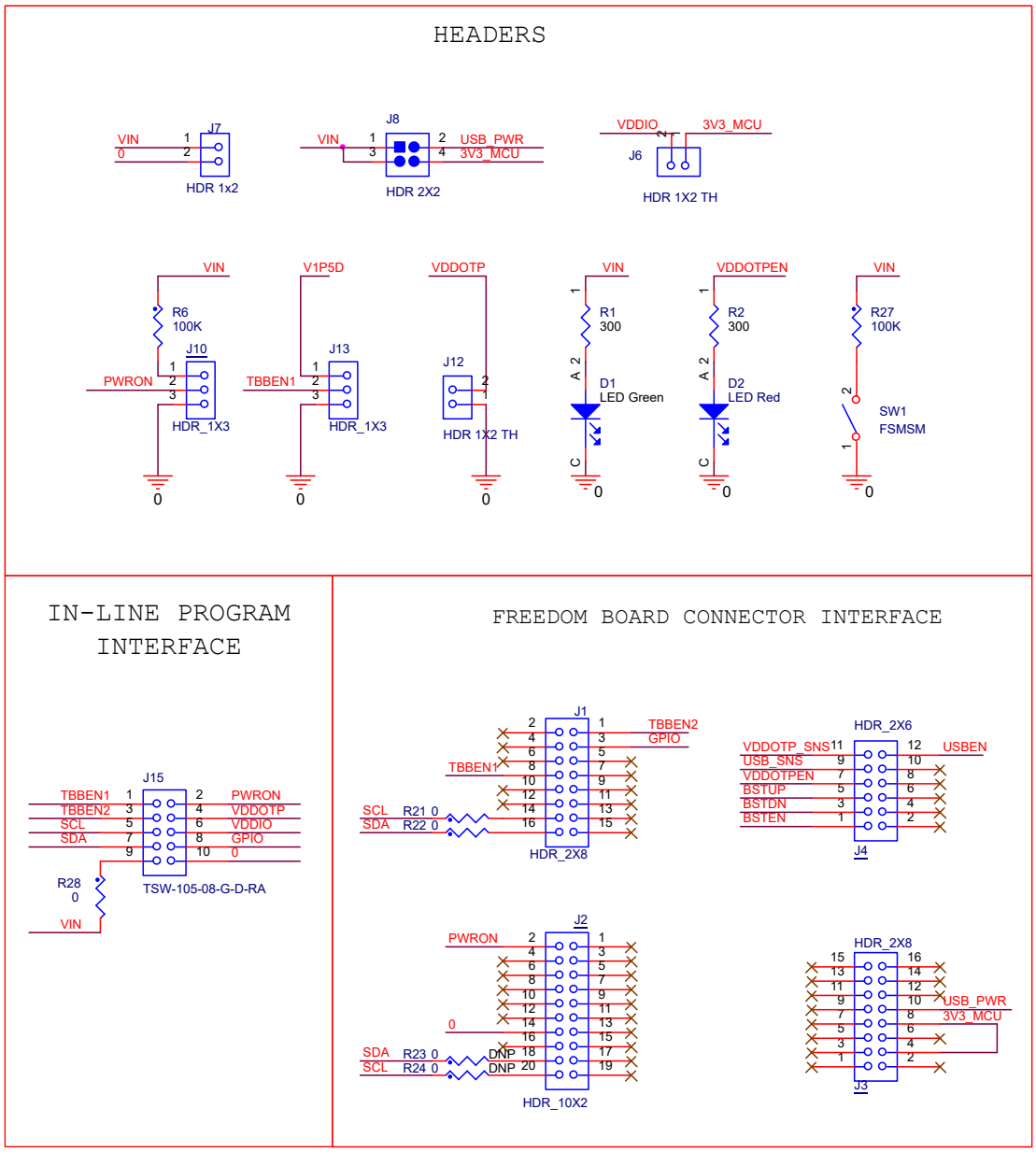


Figure 5. Jumper headers and connectors

4.4 Default jumper configurations

Table 2. KITPF8200FRDMPGM jumper locations

Name	Default	Description
J1, J2, J3, J4	—	Freedom board interface
J5	Shorted	Add VDDOTP external capacitance
J6	Shorted	Force VDDIO supply to 3.3 V from FRDM-KL25Z
J7	Disconnected	External VIN supply
J8	1-2 shorted	KITPF8200FRDMPGM input supply selection • 1-2 shorted: select USB 5.0 V from FRDM-KL25Z as input • 3-4 shorted: select 3.3 V from FRDM-KL25Z as input

Table 2. KITPF8200FRDMPGM jumper locations...*continued*

Name	Default	Description
J10	Open	PWRON voltage selection • 1-2 shorted: force PWRON high • 2-3 shorted: force PWRON low
J12	Open	Force VDDOTP to ground
J13	Open	TBBEN voltage selection • 1-2 shorted: force TBBEN high • 2-3 shorted: force TBBEN low
J14	Open	Force VIN for the boost converter • 1-2: disconnect VIN from the boost converter • 2-3: force VIN to supply the boost converter • Open: allow the MCU to control the boost input voltage supply
J15	—	Inline programming connector

4.5 Inline programming interface configuration

A set of jumper wires has been provided to provide connectivity for programming a PF81/82 device on a target board.

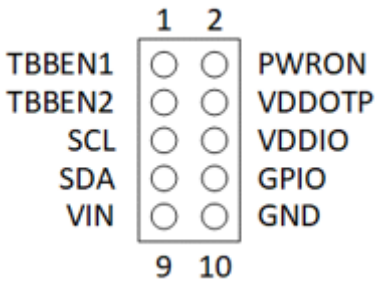


Figure 6. Inline programming interface connector

For systems that require inline programming capabilities, the following circuits should be provided to interface with the KITPF8200FRDMPGM programming board via the interface connector.

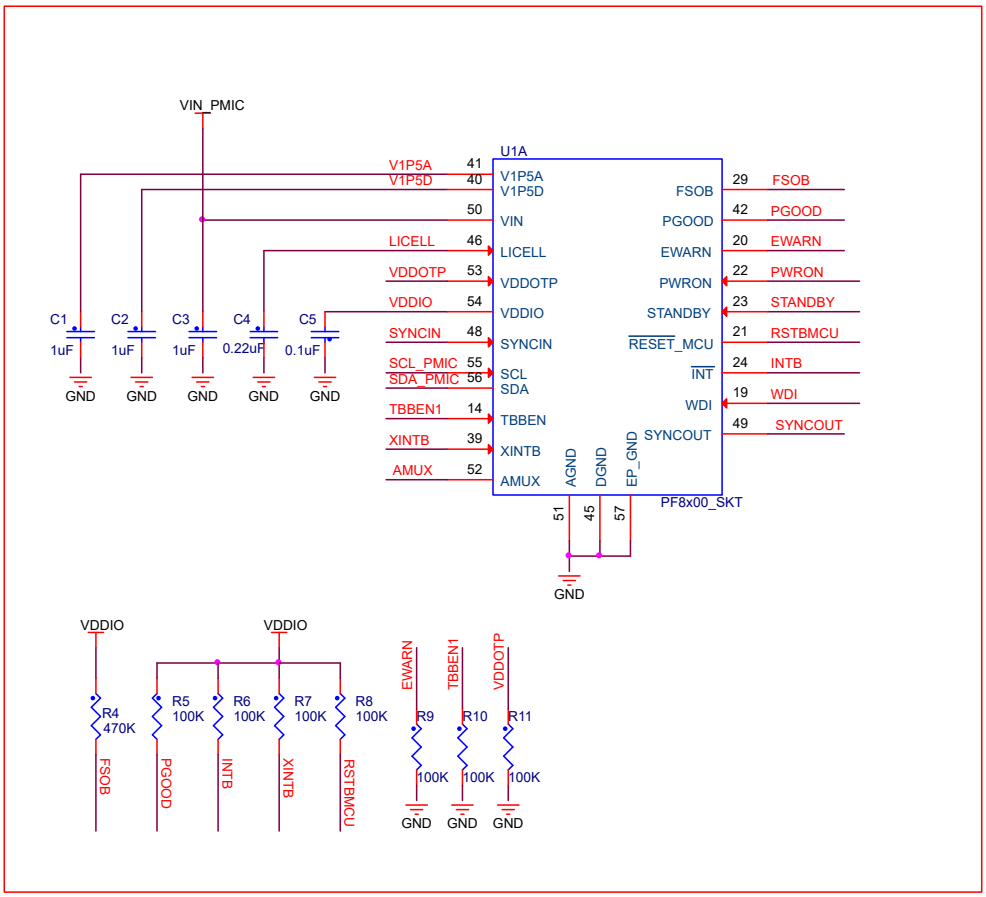


Figure 7. PMIC control signals

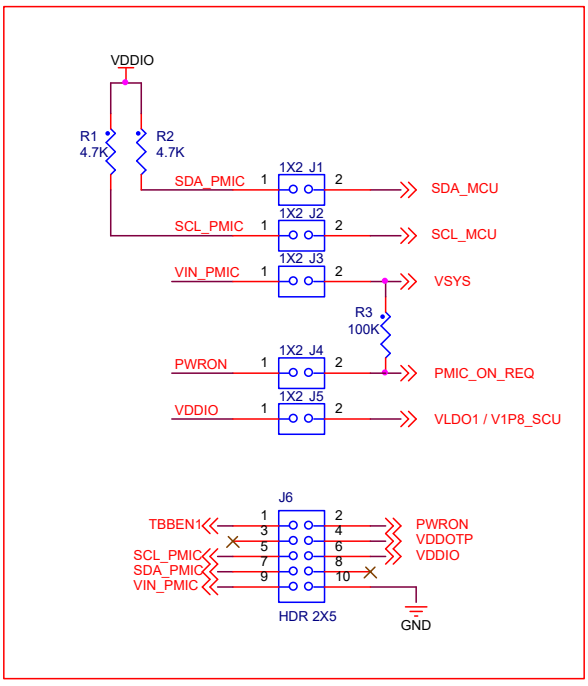


Figure 8. Programming interface

Note: *Inline programming interface connector may be required to mirror signals depending on the cable configuration used to connect with the KITPF8200FRDMPGM programmer.*

Note: *Configuration signal may require isolation from the main system to allow proper communication with the PMIC during OTP programming procedure. Such isolation may be achieved via 1x2 pin header, 0 Ω resistor or a dipswitch array.*

Note: *TBBEN2 and GPIO pins in KITPF8200FRDMPGM interface connector are intended for advance system configuration connection as needed.*

Note: *Make sure to use an eight inch or shorter connector cable to communicate between the KITPF8200FRDMPGM and the target board.*

4.6 Test points

The following test points provide access to various signals to and from the board.

Table 3. KITPF8200FRDMPGM test points

Test point name	Signal name	Description
Digital I/O signal		
TP1	VIN	Connected to pin 50 (VIN) on the socket
TP2	VDDIO	Connected to pin 54 (VDDIO) on socket
TP3	VDDOTP	Connected to pin 53 (VDDOTP) on the socket
TP4	V1P5A	Connected to pin 41 (V1P5A) on the socket
TP5	V1P5D	Connected to pin 40 (V1P5D) on the socket
TP6	SDA	Connected to pin 56 (SDA) on PMIC. Main system I^2C bus.
TP7	SCL	Connected to pin 55 (SCL) on PMIC. Main system I^2C bus.
TP8	TBBEN1	Connected to pin 14 (TBBEN) on the socket
TP9	PWRON	Connected to pin 22 (PWRON) on the socket
TP10	VDDOTPEN	Connected to VDDOTP enable FET on the boost converter block
TP11	TBBEN2	Connected to pin 3 (TBBEN2) on the inline programming connector provided to support dual PMIC programming when performing inline programming
Ground test points		
TP12, TP13, TP14, TP15	GND	Ground plane test points

5 Installing and configuring software and tools

The KITPF8200FRDMPGM uses PMIC-GUI software for all of the PF81/82 devices. The customer should use the latest version. In this document, all data captured is from the Rev. 10.0 GUI.

5.1 Download the GUI

1. Sign into the NXP website and open the page NXP GUI for Automotive PMIC Families. Download the zip files. Read the agreement for the GUI. If everything is OK, accept the agreement. The download will start to the location you select.

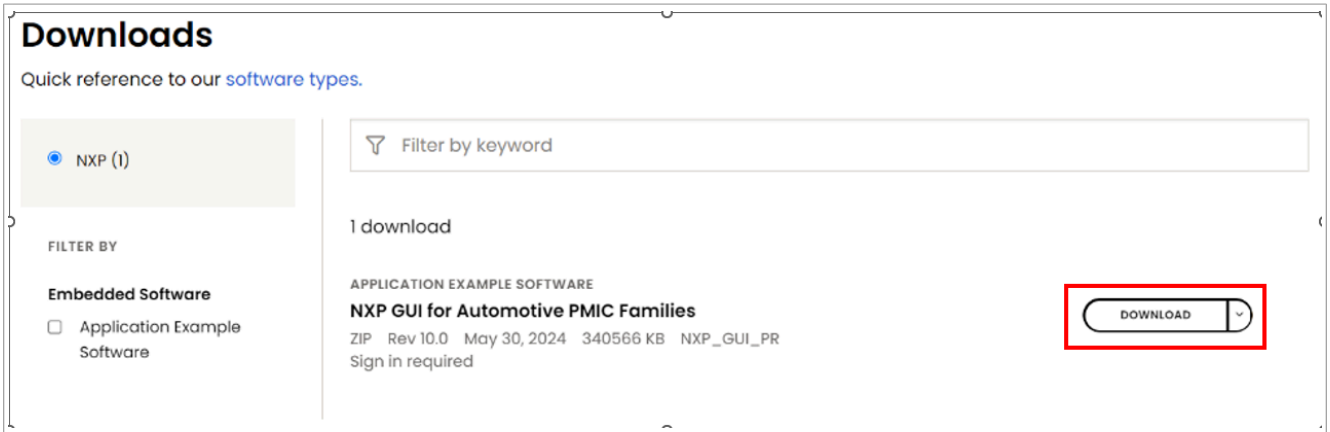


Figure 9. Download the GUI

2. Unzip the file and locate the GUI folders:

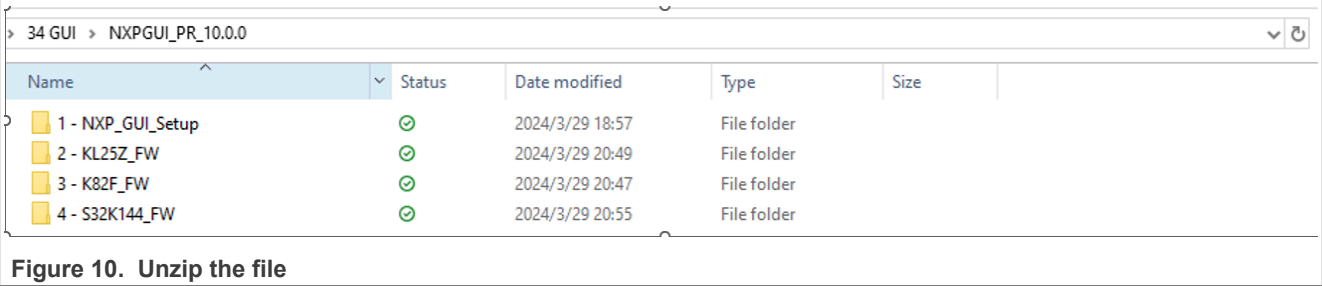


Figure 10. Unzip the file

5.2 Installing and opening the GUI

Open the NXP_GUI_Setup GUI folder and click the file named *NXP_GUI-10.0.0-Setup.exe*. The GUI will then be installed to the PC.

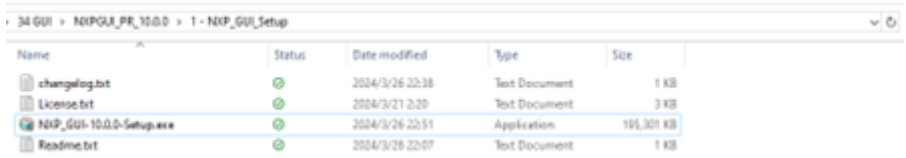


Figure 11. NXP GUI setup folder

When the installation is finished, open the GUI . You can find the interface that lists nearly all the NXP automotive PMICs. Click the product name for the one you want to program. For example, if you want to use the board to program a PF8100, select **PF8100** and click **OK**.

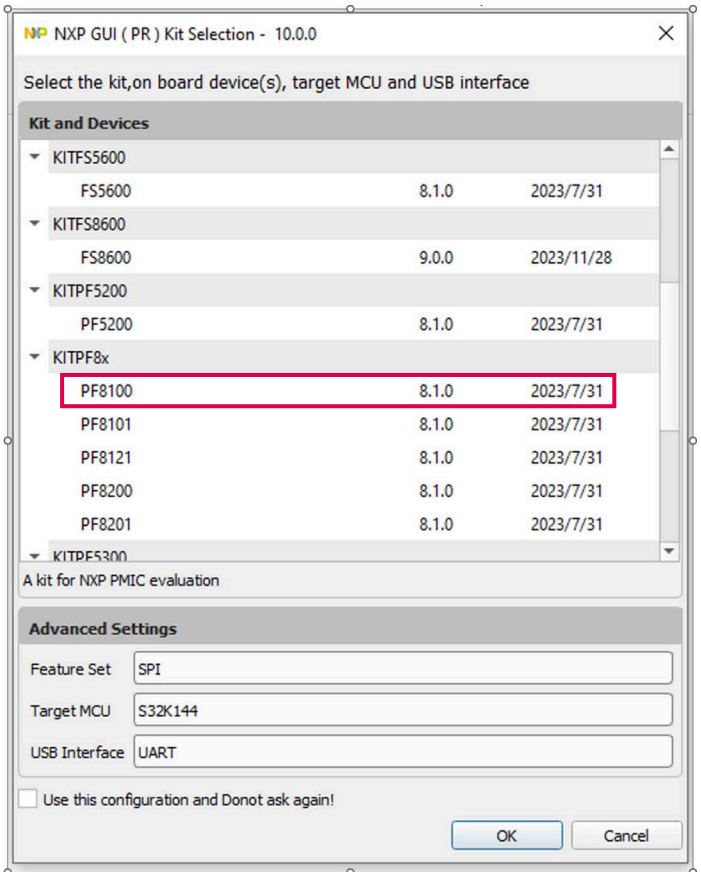


Figure 12. NXP GUI Kit Selection window

5.3 Updating the PF81/82 GUI firmware

The FRDM-KL25Z freedom board is used as a communication bridge to interface the GUI with the PMIC and other I^2C devices. The firmware is organized in three levels:

1. At the first level, the SDA connector uses the BOOTLOADER to operate as the main path to flash the functional code of the SDA processor. The BOOTLOADER is preprogrammed on the FRDM-KL25Z freedom boards and cannot be reflashed, to avoid permanent damage to the Freedom board.
2. At the second level, the SDA provides a *firmware loader* for drag and drop update of the KL25Z MCU firmware.
3. At the third level, the KL25Z MCU provides the GUI firmware in charge of converting the USB communication into MCU instructions to control digital I/Os as well as I^2C communication to the PMIC.

If the FRDM-KL25Z is not loaded with the correct firmware to support a future software upgrade, the firmware can be updated in few simple steps.

Note: *The following firmware updates are optional and can be skipped if the firmware is up-to-date.*

5.3.1 Flashing the FRDM-KL25Z firmware loader

1. Press the push button on the Freedom board and connect the USB cable into the SDA port on the Freedom board. A new BOOTLOADER device should appear on the left pane of the file explorer. This step is optional and should be performed only if the FRDM_KL25Z driver does not appear when the SDA port is connected.

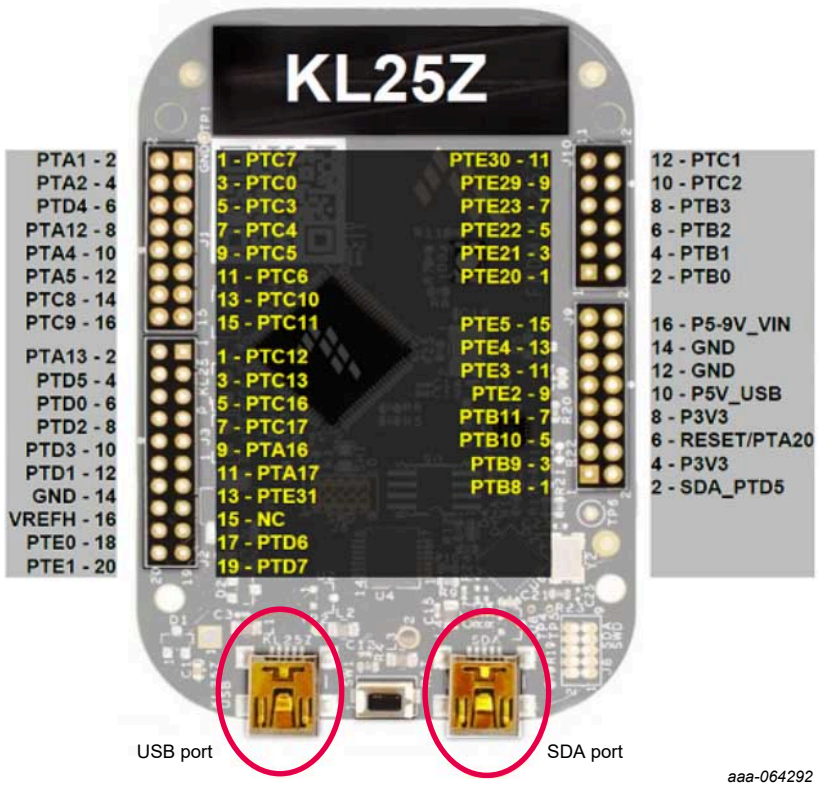


Figure 13. Freedom board ports

2. Drag and drop the file *MSD-DEBUG-FRDM-KL25Z_Pemicro_v118.SDA* into the BOOTLOADER drive. The file should be located in the *KL25Z _FW* folder.

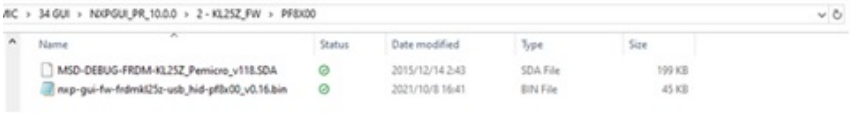


Figure 14. Drag and drop SDA file

3. Disconnect and reconnect the USB cable into the SDA port (this time without pressing the pushbutton). A new device called *FRDM_KL25Z* is installed on the PC.

5.3.2 Flashing the FRDM-KL25Z firmware loader (new release)

If a new software or silicon release requires a firmware update on the FRDM-KL25Z freedom board, use the following procedure to upgrade or downgrade the firmware of the freedom board as needed. Note that this procedure is needed only to update the firmware and may be skipped if no change is needed.

1. Connect the USB cable in the SDA port (without holding the push button).
2. Locate the ".bin" FlexGUI driver to be installed, for example *flexgui-fw-kl25z-usb-hid-pf8x00-v0.1.1.bin*, drag and drop the file into the FRDM_KL25Z driver.

Figure 15. Drag and drop bin file

3. Freedom board firmware is successfully loaded.

6 Configuring the hardware

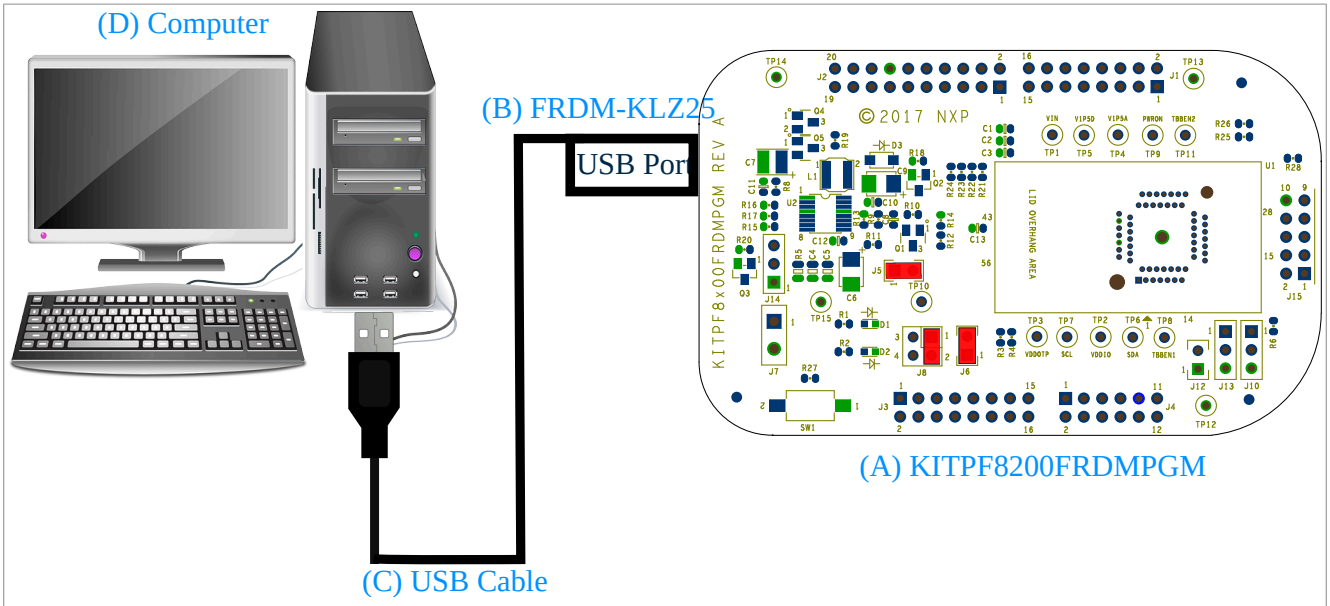


Figure 16. Typical initial configuration

Figure 16 presents a typical hardware configuration incorporating the development board and Windows PC workstation.

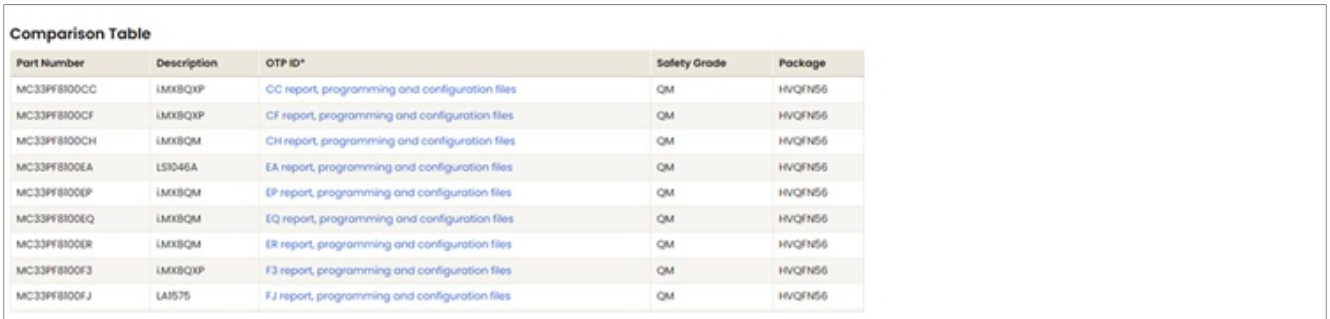
To configure the hardware and workstation as illustrated in Figure 16, complete the following procedure:

1. Plug the KITPF8200FRDMPGM board on top of the FRDM-KL25Z board.
   - For standalone chip programming: introduce a PF8x QFN device in the socket (ensure pin 1 is properly aligned)
   - For inline programming: connect the interface connector to the system board and ensure VIN power is provided either from the programmer or at the system board. Ensure SCL and SDA pins are connected only to the PMIC and isolated from the system bus, to prevent the unpowered system from pulling down/up the signal, causing communication problems.
2. Connect the USB cable from the PC to the USB port on the Freedom board.
   - Verify that the board is receiving power (green LED is lit).
3. Press the **Reset** button on the Freedom board, to ensure the board is properly recognized.

7 Getting the OTP configuration

7.1 Standard and special NXP OTP versions

Before configuring a new OTP, the customer can go to the PF81-PF82 website and check the comparison table to find standard OTP parts for the device. It is easy to download the OTP configuration files listed in the table.

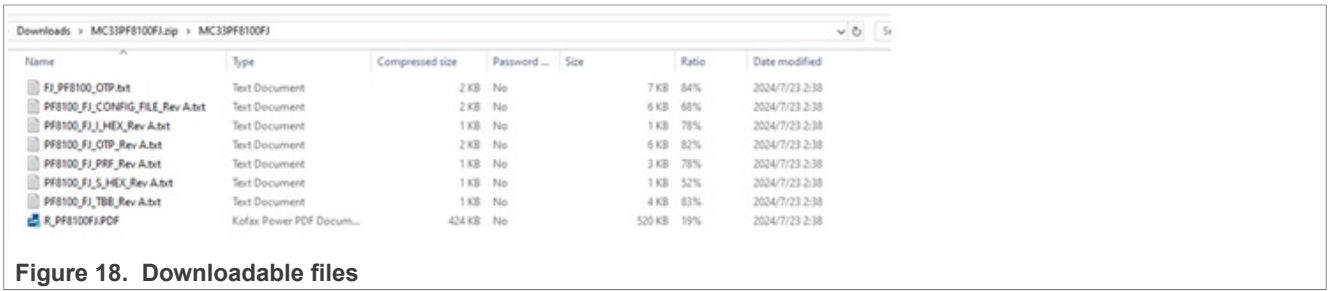


Comparison Table

Part Number	Description	OTP ID*	Safety Grade	Package
MC33PF8100CC	LMXBQXP	CC report, programming and configuration files	QM	HVQFN56
MC33PF8100CF	LMXBQXP	CF report, programming and configuration files	QM	HVQFN56
MC33PF8100CH	LMXBQM	CH report, programming and configuration files	QM	HVQFN56
MC33PF8100EA	LS1046A	EA report, programming and configuration files	QM	HVQFN56
MC33PF8100EP	LMXBQM	EP report, programming and configuration files	QM	HVQFN56
MC33PF8100EQ	LMXBQM	EQ report, programming and configuration files	QM	HVQFN56
MC33PF8100ER	LMXBQM	ER report, programming and configuration files	QM	HVQFN56
MC33PF8100F3	LMXBQXP	F3 report, programming and configuration files	QM	HVQFN56
MC33PF8100FJ	LA1575	FJ report, programming and configuration files	QM	HVQFN56

Figure 17. Comparison table

For example, if *MC33PF8100FJES* is needed, and the customer wants to achieve the same function by programming a blank part, the downloadable files listed below can be used to program the part.



Downloads › MC33PF8100FJ.zip › MC33PF8100FJ

Name	Type	Compressed size	Password ...	Size	Ratio	Date modified
FJ_PF8100_OTP.txt	Text Document	2 KB	No	7 KB	84%	2024/7/23 2:38
PF8100_FJ_CONFIG_FILE_Rev A.txt	Text Document	2 KB	No	6 KB	68%	2024/7/23 2:38
PF8100_FJ_I_HEX_Rev A.txt	Text Document	1 KB	No	1 KB	78%	2024/7/23 2:38
PF8100_FJ_OTP_Rev A.txt	Text Document	2 KB	No	6 KB	82%	2024/7/23 2:38
PF8100_FJ_PRF_Rev A.txt	Text Document	1 KB	No	3 KB	78%	2024/7/23 2:38
PF8100_FJ_S_HEX_Rev A.txt	Text Document	1 KB	No	1 KB	52%	2024/7/23 2:38
PF8100_FJ_TBB_Rev A.txt	Text Document	1 KB	No	4 KB	83%	2024/7/23 2:38
R_PF8100FJ.PDF	Kofax Power PDF Docum...	424 KB	No	520 KB	19%	2024/7/23 2:38

Figure 18. Downloadable files

In addition to standard parts, NXP can provide some special OTP ID configurations such as those designated to work with non-NXP processors or other specific applications. Contact your NXP representative to get the files.

7.2 Generating OTP files using the GUI

If there is no existing version to support a project, the GUI can be used to set the OTP configuration and generate the OTP programming files.

1. Install and open the GUI as in Section 5.2, and select the desired kit. For example, if you want to use PF8200, select **PF8200** and open that.
2. Select the **OTP** tab and view the OTP configuration pages. Set the configuration on these pages according to the needs of the project.

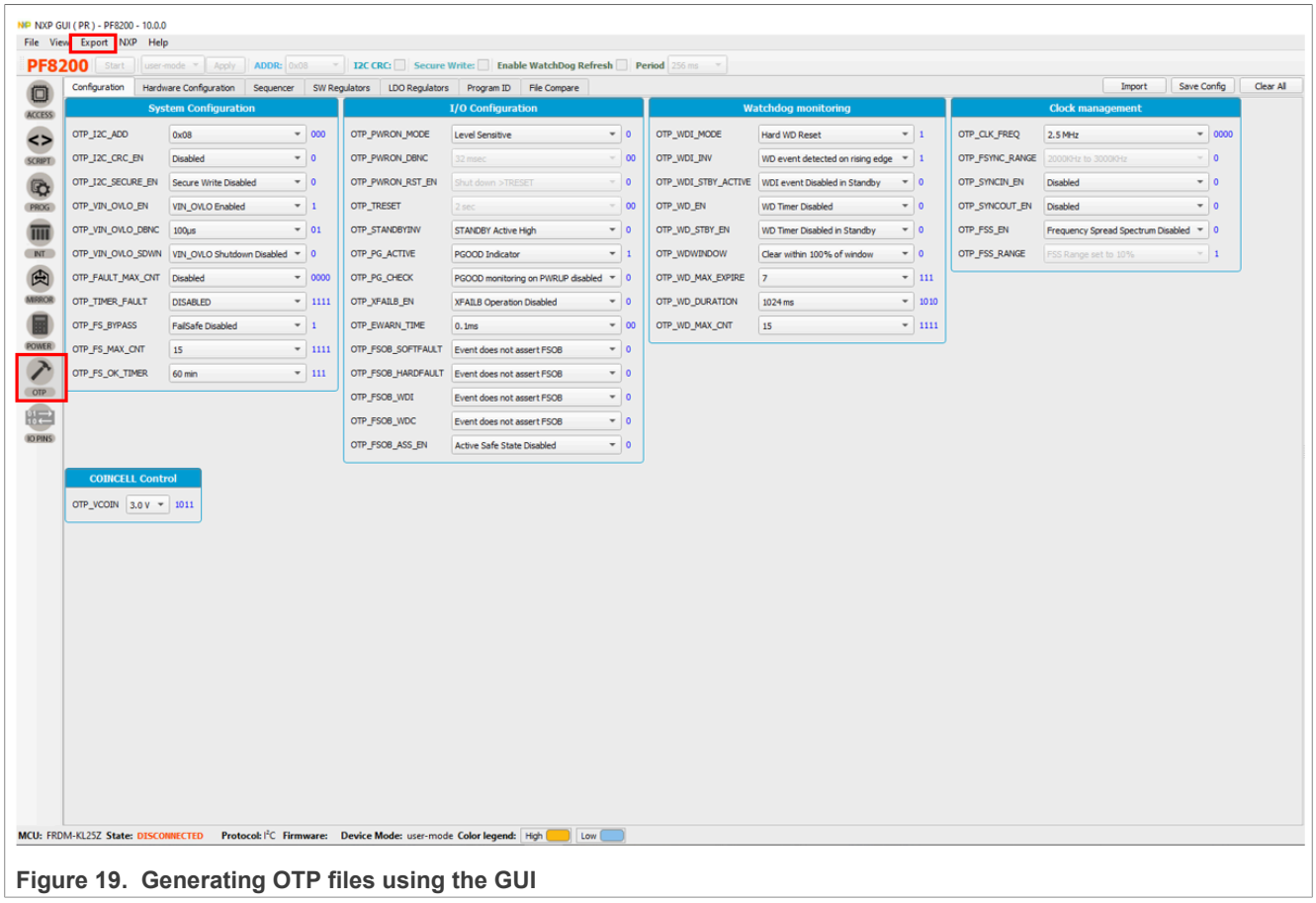


Figure 19. Generating OTP files using the GUI

3. Save the configuration and export ***PF8200_XX_OTP.txt*** into the desired directory. The part can be programmed using this file.

Note: *Before the GUI was released to the website, there was an Excel tool called F8xxx custom OTP request form for PF82 family OTP configuration. NXP now recommends that customers use the GUI. OTP files that were generated using the Excel form can still be used to perform OTP programming, and the config files generated from Excel can be imported to the GUI.*

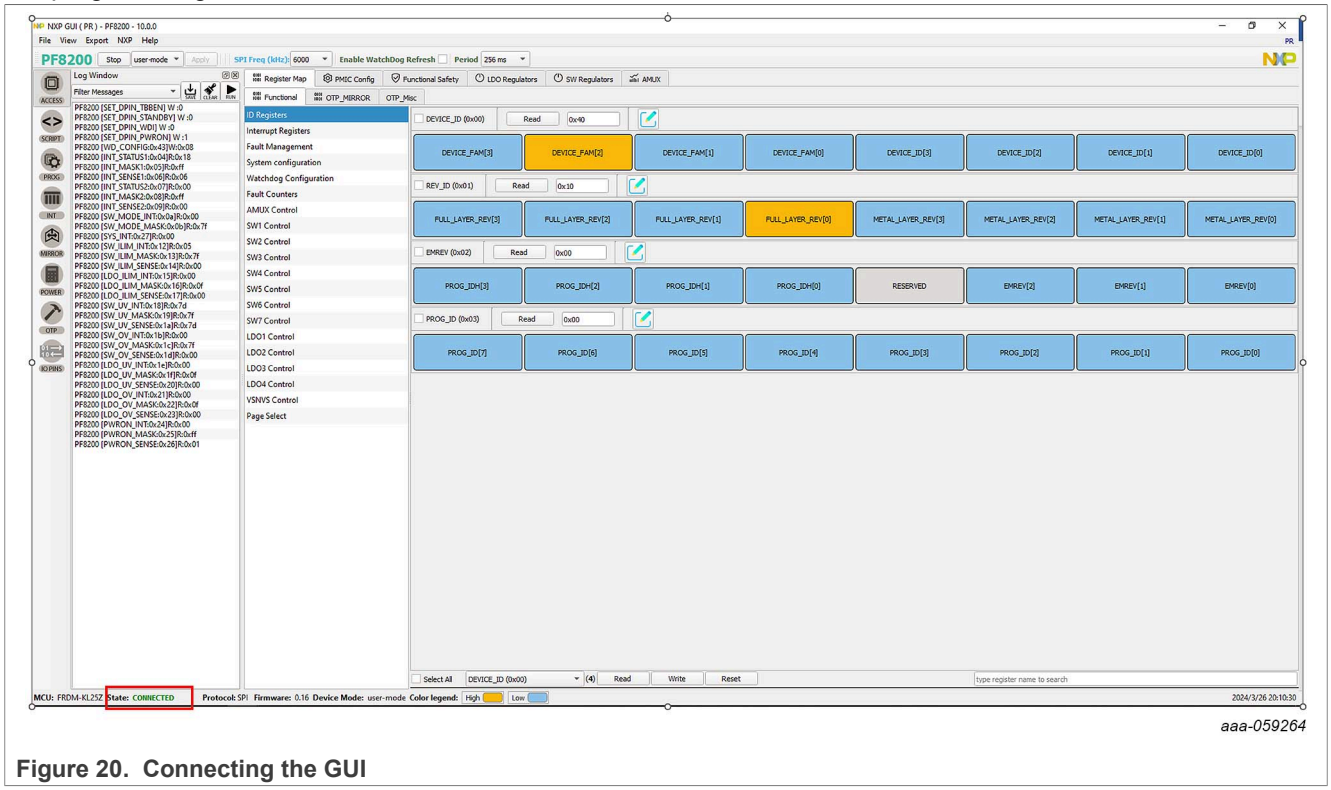
Note: *PF8x50 devices are compatible with PF8x00. If using PF8x50 to program a PF8x0x OTP configuration, import the PF8x0x config files from the PF8x50 GUI, and then generate one new set of OTP .txt files to do the programming.*

8 Programming the OTP configuration with the GUI

After connecting the KITPF8200FRDMPGM board as in Section 6, use the following steps to program the OTP configuration in the target PF81/PF82 device.

8.1 Connecting the GUI

1. After installing the GUI as in Section 5, you can go to the Windows Start > NXP GUI folder to find the application and open it. After opening the GUI, select the product you want to program. PF8x0x and PF8121 are in the same group and PF8x50 devices are in the same group.
2. Open the GUI as in Figure 20, and put the device in the socket. Make sure the GUI kit selected is the same as the part being programmed. For example, if a PF8200 blank part needs to be programmed, the PF8200 GUI kit will be selected and open.
3. Click the **Start** button of the GUI. If the firmware is good, the FRDM-KL25Z state will be shown as **CONNECTED** as in Figure 20. Once the device is connected, the system is ready to perform OTP programming.



aaa-059264

Figure 20. Connecting the GUI

If the device cannot be connected, check Section 5 to update the board firmware to match the latest GUI version.

8.2 Verifying the device

1. After connecting the GUI and the device enters User mode, view the **Access** tab. Addresses 0x00 - 0x03 in the functional register map show the device information. Make sure the I^2C can communicate, and the device is the one expected.
   The DEVICE_ID register (address 0x00) provides general information about the PMIC.
   .
   - DEVICE_FAM[3:0] indicates the PF8xxx family of devices 0100 (fixed)

- DEVICE_ID[3:0] provides the device type identifier
  0000 = PF8150, PF8100
  1000 = PF8250, PF8200
  0001 = PF8101
  1001 = PF8201
  0002 = PF8121

The EMREV register (address 0x02) provides information about the device technology.

- EMREV[2:0] = 001 means the device is PF8x50
- EMREV[2:0] = 000 means the device is PF8x00

2. Change to Test mode and change the GUI page to the **PROG** tab. Read the **Fuse Box Status** to make sure the device is blank and accessible to program. The status of the good blank part should be as in Figure 21.

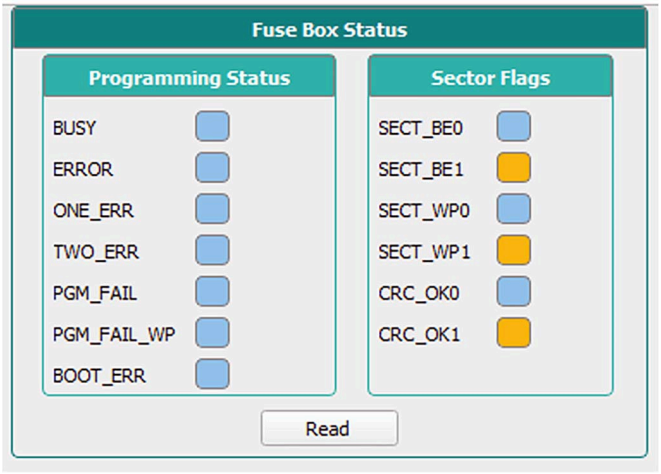


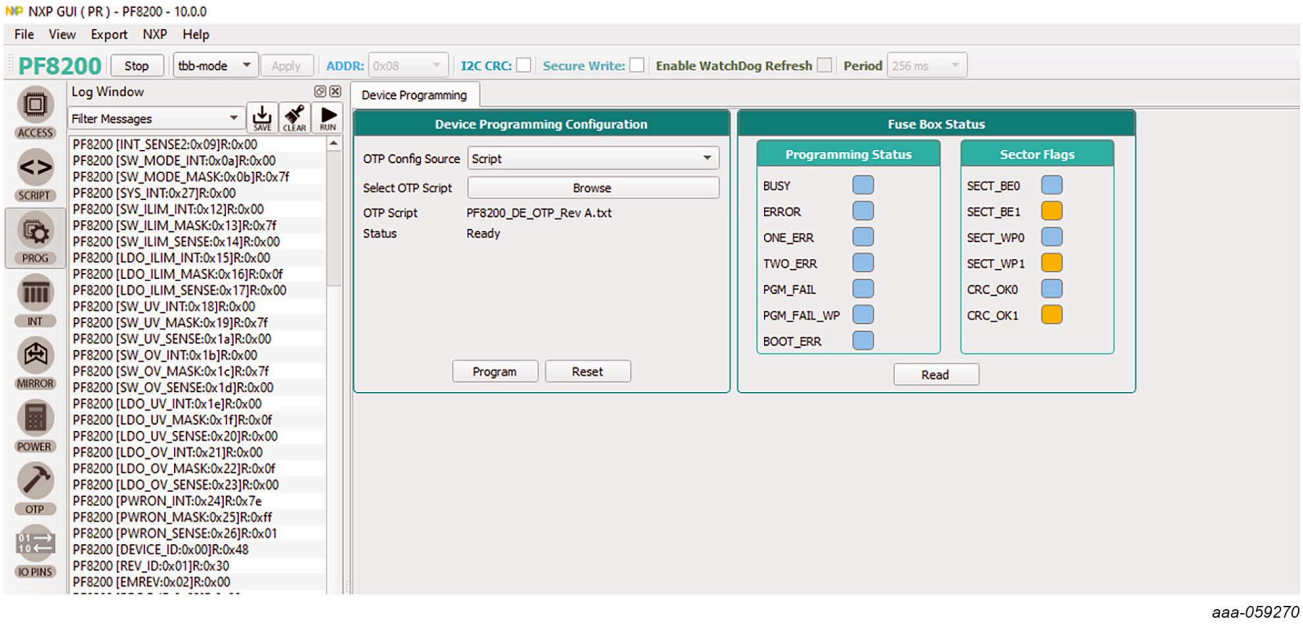
Figure 21. Fuse box status

8.3 Programming the device

There are two methods that support OTP programming. One method is to use the **PROG** tab to program the device.The other method is to use the **SCRIPT** function to load an OTP file and run it. For both methods, the file used is the same: ***PF8xxx_XX_OTP.txt***

8.3.1 Using the PROG tab to program the device

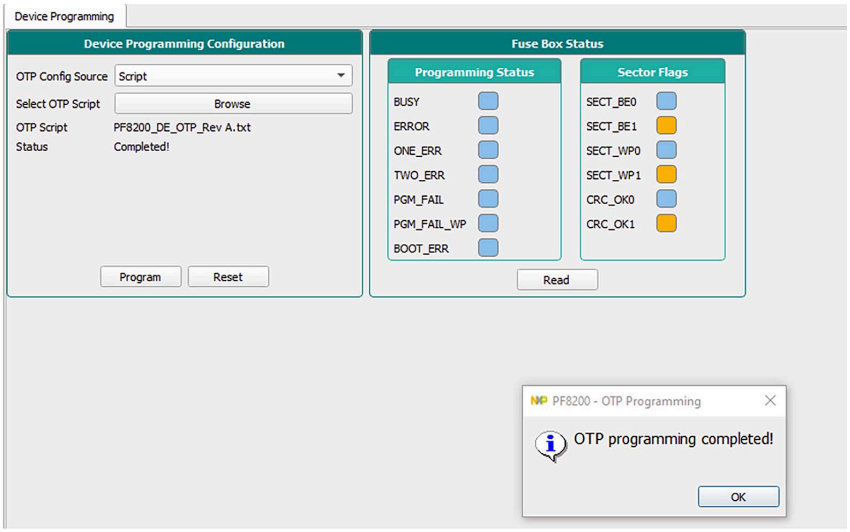
1. Keep the device in TBB mode, select the **OTP Config Source** as **Script**, and click **Browse** to load the OTP file generated in the known location. The status should be **Ready**.



aaa-059270

Figure 22. PROG tab

2. Click **Program**. If everything goes well, there will be a pop-up window showing **OTP programming completed!**

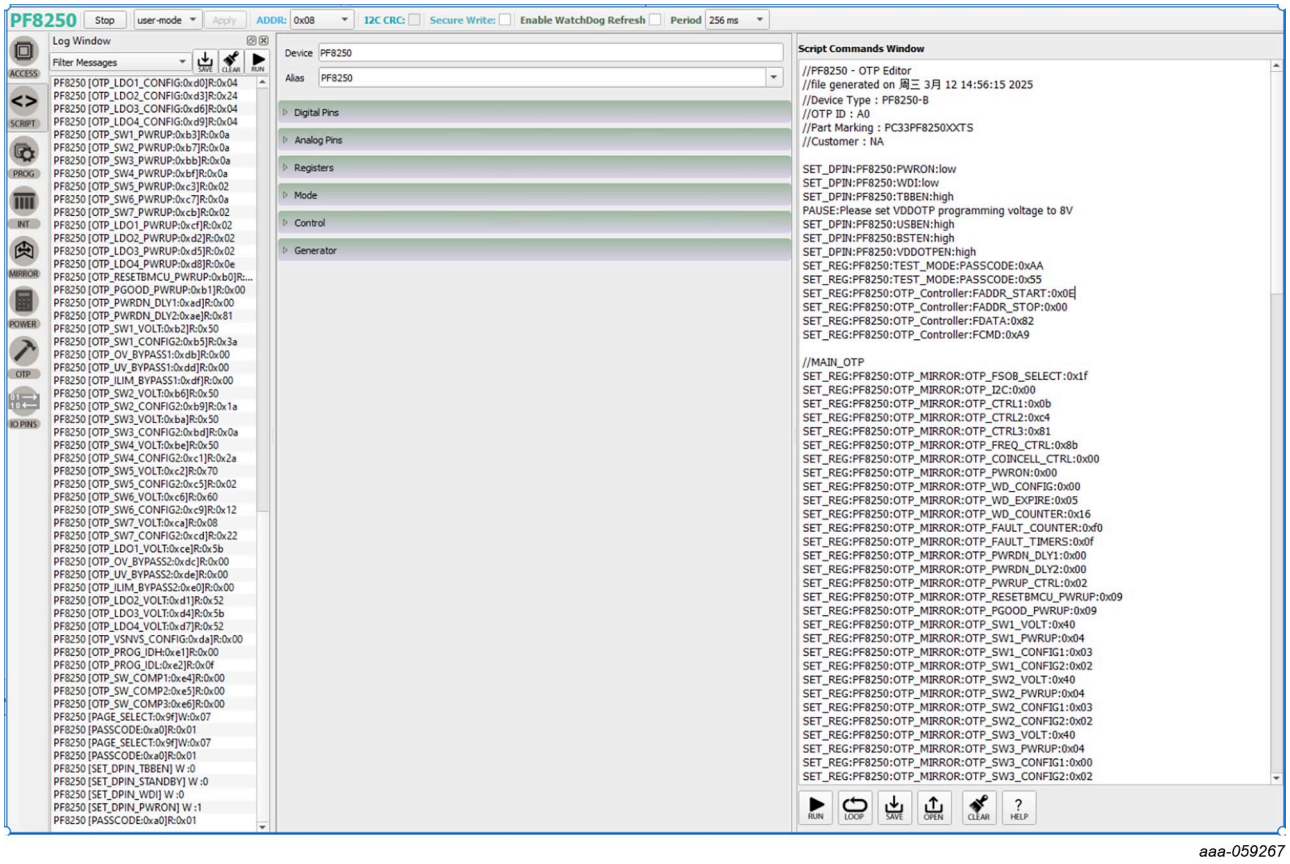


aaa-059266

Figure 23. OTP programming completed

8.3.2 Using the SCRIPT tab to program the device

Open the GUI and turn to the **SCRIPT** tab. Click the **OPEN** button to open the generated files and load the script. Click the **RUN** button to run the commands that program the device.



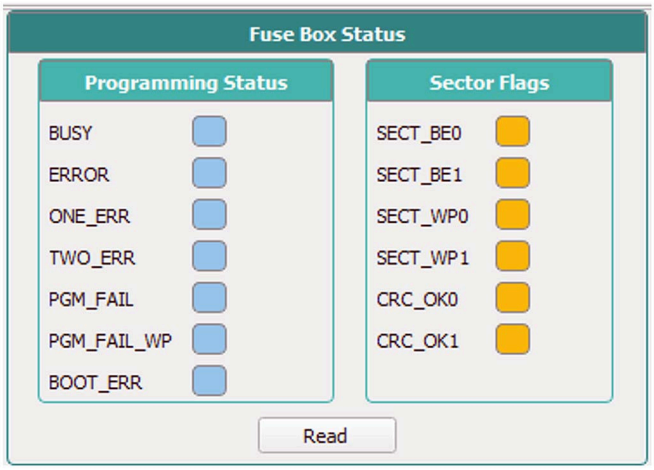
aaa-059267

Figure 24. SCRIPT tab

8.3.3 Verifying the programming

Note: *Make sure to use the same GUI and OTP script as the device. For example, if PF8150 is programmed, open the PF8150 GUI and run the PF8150 script. Do not program the device using the wrong script. The command for PF8x50 is very different from PF8x0x or PF821. The process may be the same, but the OTP scripts are very different.*

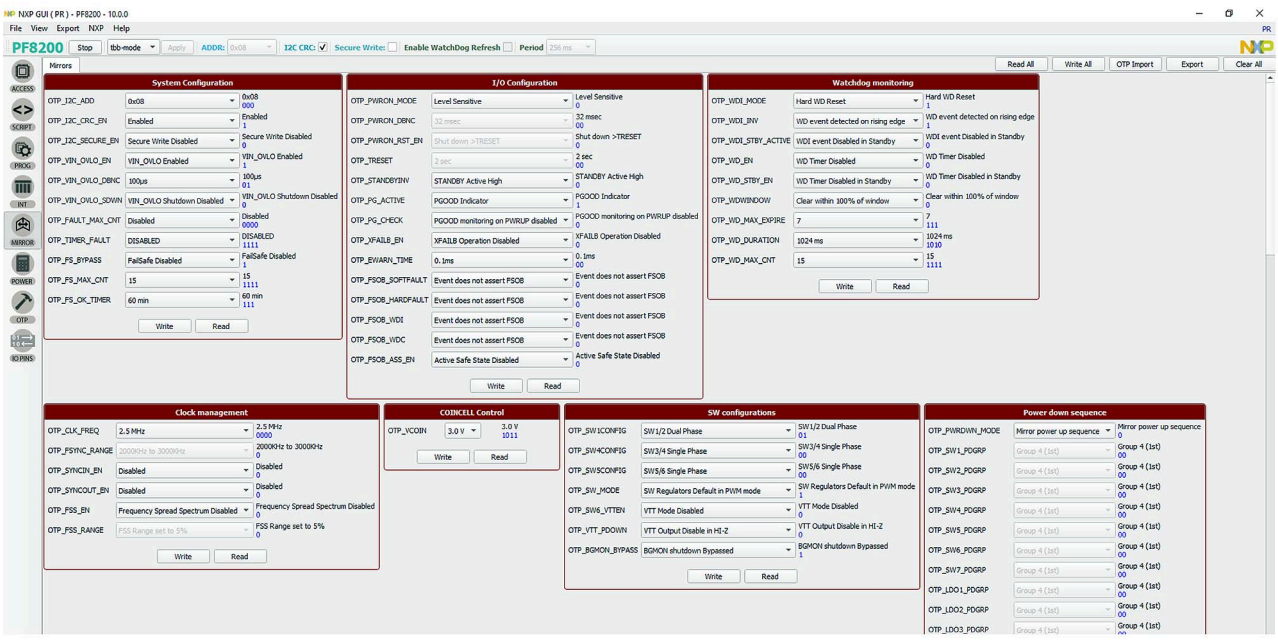
1. To verify proper configuration of the device, stop the communication with the device, disconnect and reconnect the USB cable, and establish connection with the board again. This process is needed to ensure the PMIC has a complete power cycle and the new OTP configuration is loaded in the Mirror registers. Check the **Fuse Box Status** again in TBB mode. It should be the status shown in Figure 25. If the communication does not work, check whether CRC or Secure write is enabled.



aaa-059268

Figure 25. Fuse box status

2. Open the GUI **MIRROR** tab and click **Read All**. If there is data in the mirror registers, and if the values are correct, then the device was programmed successfully.



aaa-059269

Figure 26. MIRROR tab

9 References

[1] **KITPF8200FRDMPGM** — detailed information on this board, including documentation, downloads, and software and tools
http://www.nxp.com/KITPF8200FRDMPGM

[2] **PF8100/PF8200** — product information on multi-channel power management integrated circuit
http://www.nxp.com/PF81-PF82

[3] **PF8101/PF8201** — product information on multi-channel power management integrated circuit
https://www.nxp.com/PF8101-PF8201

[4] **PF8121** — product information on multi-channel power management integrated circuit
http://www.nxp.com/PF8121

[5] **PF8150/PF8250 automotive** — product information on multi-channel power management integrated circuit
http://www.nxp.com/PF81-PF82

[6] **PF8150 industrial and consumer** — product information on multi-channel power management integrated circuit
http://www.nxp.com/PF81-PF82

10 Revision history

Revision history

Document ID	Release date	Description
UM11162 v. 2.0	6 January 2025	• Added keywords and abstract • Global: added information regarding newly supported PF8150/PF8250 devices, including programming methods • Updated Section 1 • Updated Section 3.1 • Updated Section 3.2 • Updated Section 3.3 • Updated Section 4.1 • Updated Section 4.2.1 • Revised Section 4.5 • Revised Section 5, including its subsections • Revised Section 6 • Revised, retitled, and added two new sections under Section 7: Section 7.1 and Section 7.2 • Updated GUI information to match the latest GUI version • Updated Section 8.2 • Updated note in Section 8.3.3 • Updated image in Section 8.3.2 • Updated Section 9 to add PF8150/PF8250 • Updated legal information • Updated revision history format to current standard
v. 1	20190423	Initial version

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