

LZE GMBH • FRAUENWEIHERSTRASSE 15 • 91058 ERLANGEN

EFFICIENT® FH101RF EVALUATION KIT

APPLICATION NOTE BOOT LOADER



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EDITION 1
REVISION 2

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Preliminary

1 Introduction

The application note describes the boot loader and its functionality. In the following, the boot loader is referred to as btl. The btl functionality of the development kit is part of the MCU firmware at delivery. This allows the user to easily change the MCU firmware without an additional programming adapter. This is a proprietary implementation of the boot loader with usb support. The control is done by the included application FlashTool which is part of the FH101RF development kit. Note: The boot loader code is located in a separate MCU flash memory area and will not be overwritten when programming the microcontroller with FlashTool.

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2 Using the boot loader

In the delivery state the boot loader functionality of the microcontroller is active, for more detailed information see the data sheet of the MCU. This means that on every power up or reset sequence of the MCU it is called before the main program is executed. The btl has two important states: active and passive.

- In the passive state, the main program of the MCU is executed immediately.
- In the active state, the btl awaits further instructions from the computer the execution of the main program is prevented until further notice.

The default state of the boot loader is passive, i.e. not visible to the user. To use the btl functionality such as writing to the MCU memory, it must first be set to the active state. This process is explained in the following chapters.

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3 BTL Active State

The sequence control of the btl checks with each reset or power up sequence of the microcontroller whether one of the conditions for the active state of the btl is fulfilled. If so, the btl state is set to active. The active btl state is indicated by alternating blinking of the two LEDs. A further requirement for the active state is the installed D2XX usb driver.

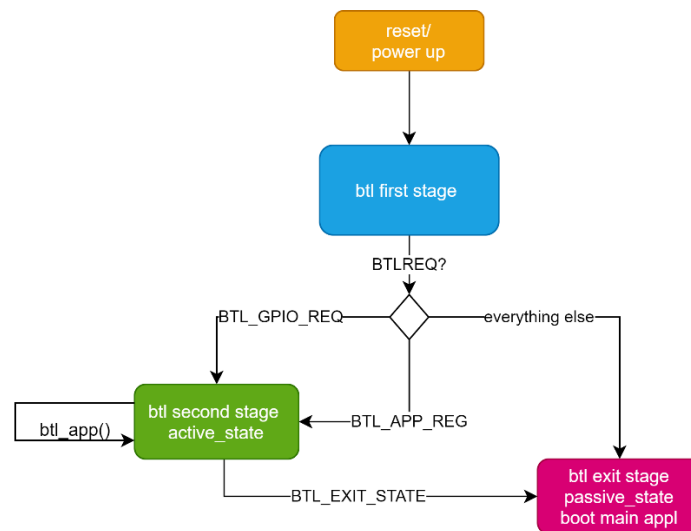


Figure 1: BTL flow diagram

The boot loader in version BTL1.0 supports two activation states.

- BTL_GPIO_REQ: active mode by external connection of the MCU inputs.
- BTL_APP_REQ: active mode through shared memory

3.1 BTL_GPIO_REQ

The activation state is achieved by applying the VDD voltage to the GPO1 pins on the board's pin header. To do this, the following steps must be carried out in the specified order.

Attention: The hardware of the board can be permanently damaged if the jumpers are not inserted correctly.

- Step 1: Remove the usb-cable and the battery if equipped, for step 2 no voltage must be applied to the hardware.
- Step 2: Remove pin header jumpers at all locations.
- Step 3: On the MCU side of the pin header connect the pins VDD and GPIO1 with jumpers, see Figure 2.
- Step 4: Connect usb cable to the board
- Step 5: Flash the firmware with FlashTool
- Step 6: Remove the usb cable, assemble all pin header jumpers

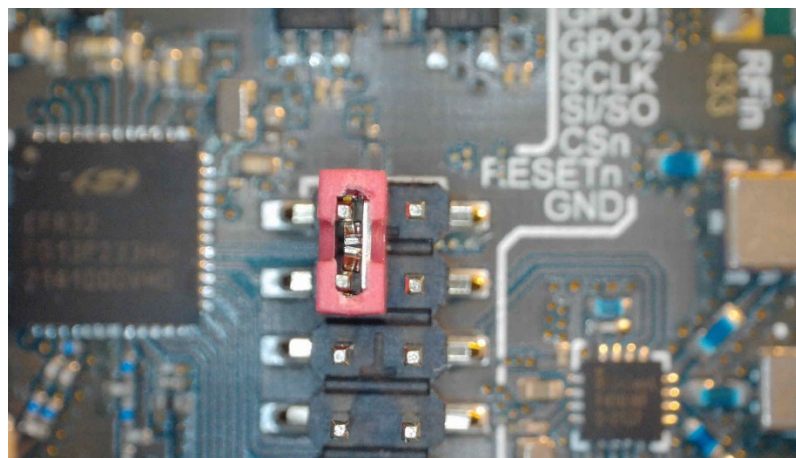


Figure 2: BTL_GPIO_REQ jumper configuration

After step 4, the btl is in the active state, which is indicated by the two LEDs. These light up alternately.

3.2 BTL_APP_REQ

The activation state takes place in the main program of the MCU, which communicates with the boot loader via shared memory. This activation state is implemented in the delivery version of the firmware.

4 FlashTool

The FlashTool software provides the user with an interface for communication with the boot loader. The communication is done through the specified btl protocol. The communication protocol is not part of this document and is not explained further.

At startup, the application determines the development boards connected to the usb bus. These are displayed in the "Device select" overview. At the same time, the boot loader of the connected development boards is initialized. If the initialization is successful, an entry: DeviceX loader detected is made in the log window of the application. The information about MCU ID and MCU flash parameter can be taken from the log window. Furthermore, the button: Browse firmware is enabled when the loader is successfully initialized. This allows the selection of the firmware file. The application supports only the INTEL HEX format.

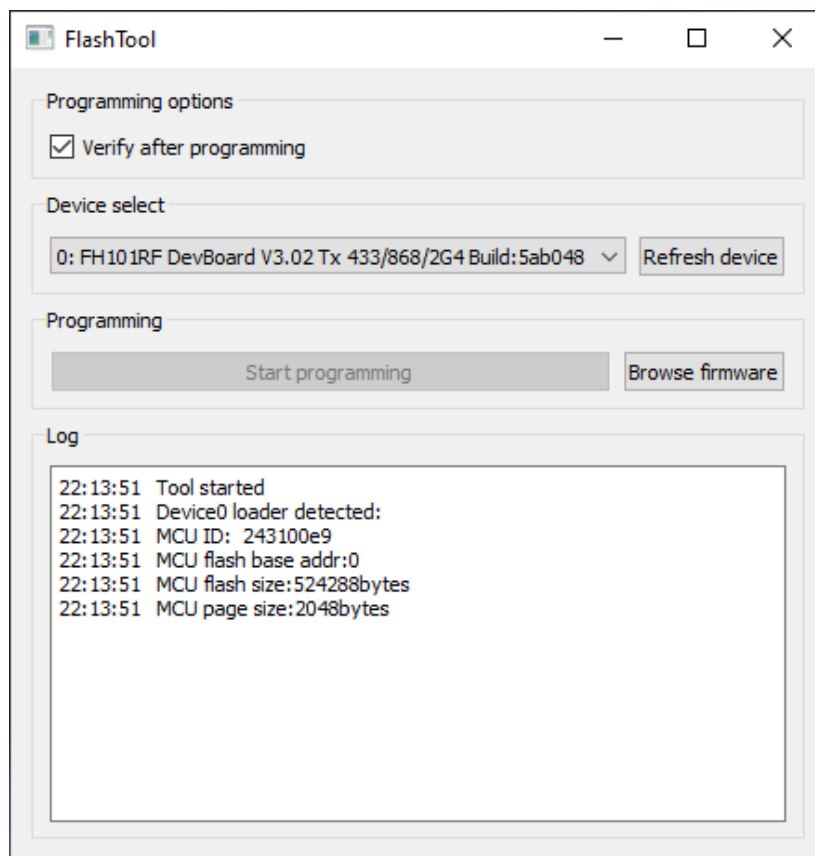


Figure 3: FlashTool application

Figure 3 shows the FlashTool application. If a firmware file in INTEL HEX format is selected the application checks the checksums, if there are no errors the firmware file can be transferred to the MCU by confirming the Start programming button. The status of the transfer and verification process is shown in the log window of the application. After the successful transfer of the firmware to the flash of the MCU, the btl

independently boots the flashed firmware and returns the information about the firmware to the application. This appears in the log window. After closing the application, the development kits still in active mode are set to passive mode.

We recommend to flash the firmware, connect only one development kit board to the PC at a time. If the flash process is interrupted, it must be repeated.

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5 Assembly and Function Matrix

Board Mode	Firmware	Red LED	Green LED	Antenna TxRx	Antenna RFin433	Antenna RFin868	Antenna RFin2G4	D2XX Driver	USB – PC connection	Pin-Header-Jumpers	CR2032	Onboard current meas. switch
-	-	On/Off Alternate (1sec)	On/Off Alternate (1sec)	-	-	-	-	Yes	Yes	GPO1 short to VDD on MCU side	No	-

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6 PC Requirements

The following PC requirements must be met:

- OS: Windows 10
- USB Interface: min. USB 1.1
- D2XX Driver: <https://ftdichip.com/>

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Qt5GUI.dll	Qt5Gui	5.12.2	LGPL, Vers. 3
Qt5Svg.dll	Qt5Svg	5.12.2	LGPL, Vers. 3
Qt5Widgets.dll	Qt5Widgets	5.12.2	LGPL, Vers. 3

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9 Appendix Licence text

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Version 3, 29 June 2007

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