EZ-USB™ FX Control Center user guide

About this document

Scope and purpose

This document describes the usage of EZ-USB™ FX Control Center, which is a desktop application that can be used for fetching the device information, perform data transfers or data loopback over USB endpoints, and measure the USB data transfer performance. This application also supports programming of EZ-USB™ FX devices.

Intended audience

This document is intended for embedded developers using EZ-USB™ FX Software Development Kit (SDKS).

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1 Introduction

1.1 EZ-USB™ FX device family

EZ-USB™ FX is the next-generation device in the Infineon USB device controller family. EZ-USB™ FX is a USB device controller that enable customers to build high resolution, higher frame rate cameras for machine vision, industrial, surveillance, medical or consumer cameras, 4K HDMI to USB capture cards, and so on.

1.2 EZ-USB™ FX Control Center

EZ-USB™ FX Control Center helps you fetch the device information, perform data transfer or data loopback over USB endpoints, and measure the USB data transfer performance. It also supports programming internal flash and external SPI flash memories.

1.3 Software prerequisites

Table 1 lists the software prerequisites needed to run EZ-USB™ FX Control Center.

Table 1 Prerequisites

#	Software	Version
1	Operating system	Microsoft Windows 10 or later
2	Microsoft Visual C++ Redistributable	2015-2022

2 EZ-USB™ FX Control Center overview

2.1 Installation guide

1. Install EZ-USB™ FX Control Center using the installer *EZ-USB_FX_Control_Center_Setup_signed.exe* installer.
2. After the installation, open the application from the desktop icon for Windows OS or the Windows menu.

The device connectes to the application automatically. Figure 1 shows the EZ-USB™ FX Control Center main screen without an EZ-USB™ FX device connected; Figure 2 shows an EZ-USB™ FX device connected in EZ-USB™ FX Control Center.

2.2 Features

EZ-USB™ FX Control Center supports the following features:

- Descriptor information
- Data transfer over Control, Bulk, Interrupt, and Isochronous endpoints
- Verify data loopback over the USB endpoints
- Measure USB Bulk/Isochronous endpoint data transfer performance
- Option to program EZ-USB™ FX devices over the USB vendor interface to internal flash or external SPI flash memories

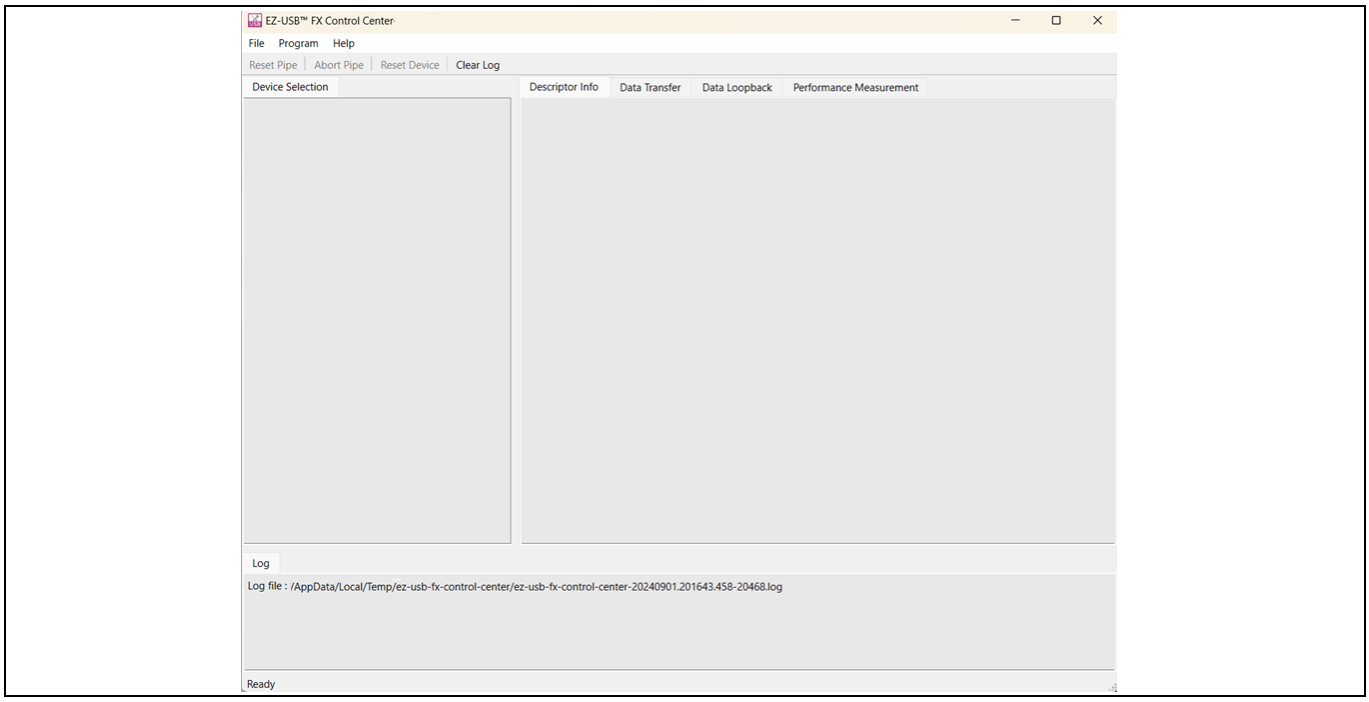

Figure 1 Home screen without EZ-USB™ FX device connection

EZ-USB™ FX Control Center overview

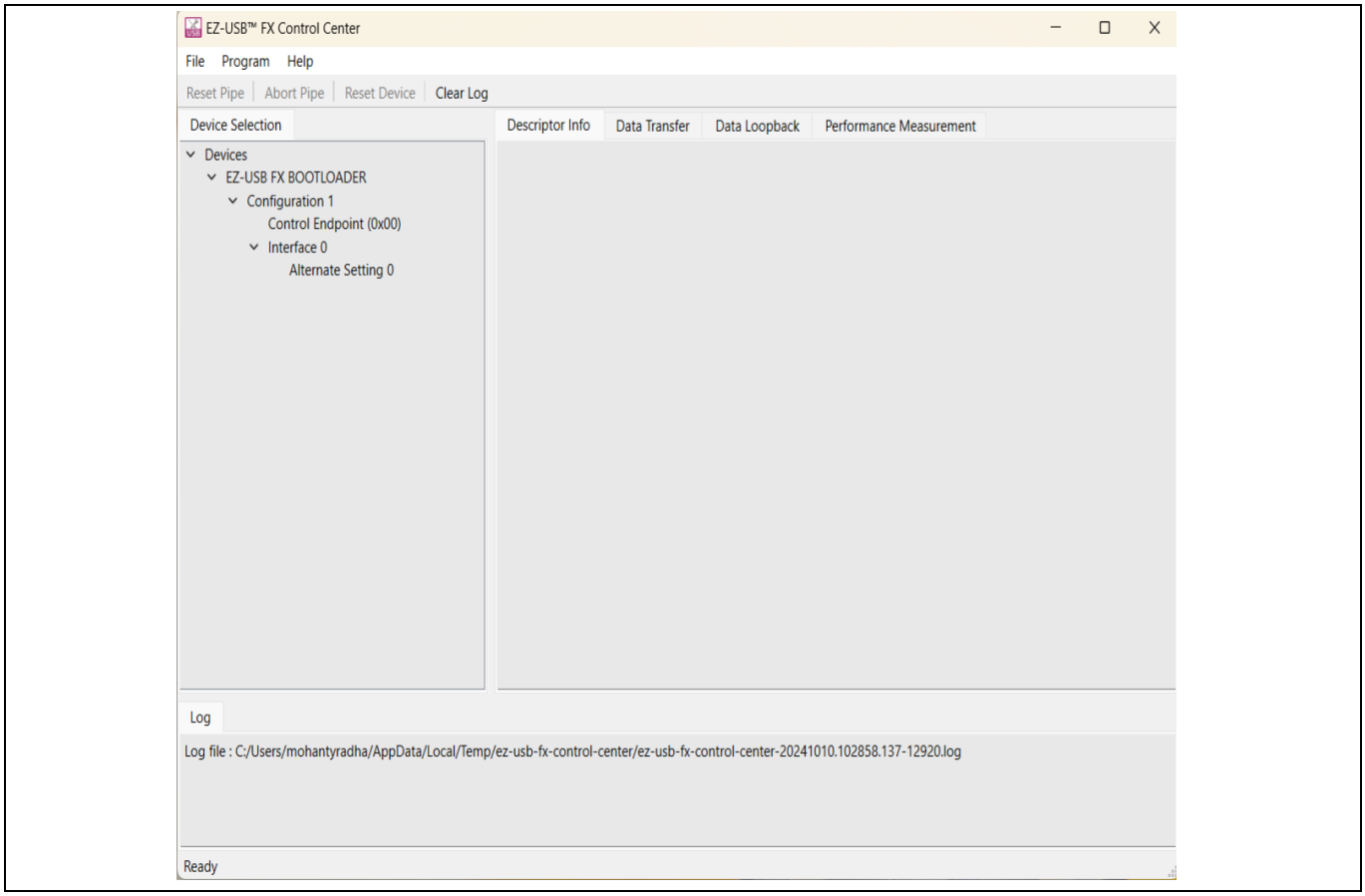

Figure 2 Home screen with EZ-USB™ FX device connection

3 EZ-USB™ FX Control Center UI description

3.1 Menu

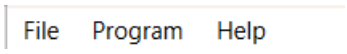

Figure 3 Menu bar

There are three menu options, which are described below.

3.2 File

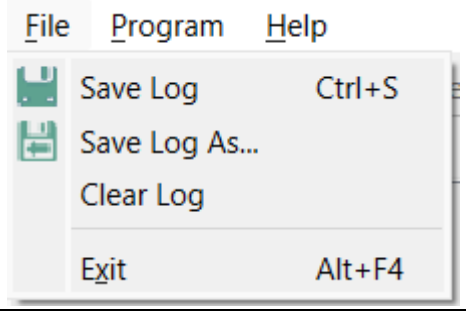

Figure 4 File

- **Save Log** – Saves the logs to the current log file
- **Save Log As** – Saves the logs to a new file with different name
- **Clear Log**– Clear logs from notice list window
- **Exit** – Closes the tool

3.3 Program



Figure 5 Program

- **Internal Flash** – Downloads the firmware program file into the internal flash memory. Deactivates when the device is not connected (a) and activates when the device is connected (b). Opens the **Program** functionality window.
- **External SPI Flash** – Downloads the firmware program file into the external SPI flash memory (b). Opens the **Program** functionality window.

3.4 Help

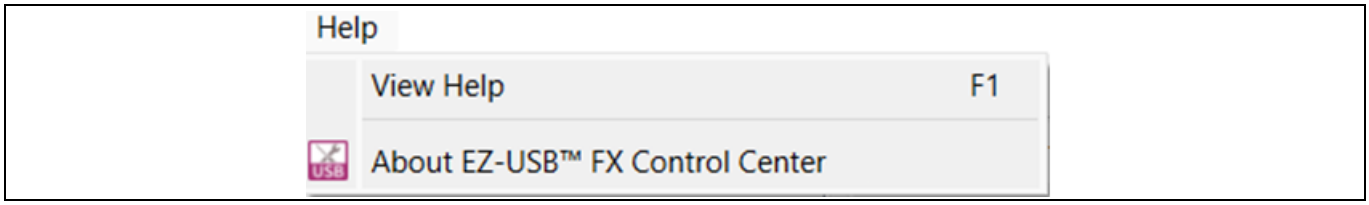

Figure 6 Help

- **View Help** – Opens the user guide document
- **About EZ-USB™ FX Control Center** – Opens the **About** box for version information with the links to open Infineon.com and the current session log file

3.5 Toolbar

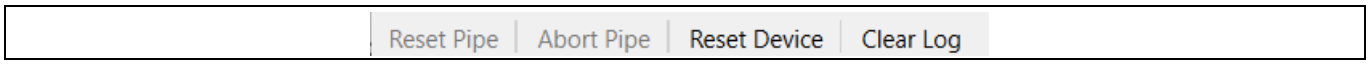

Figure 7 Toolbar

The toolbar contains **Reset Pipe**, **Abort Pipe**, **Reset Device**, and **Clear Log** options.

- **Reset Pipe:** To reset a pipe associated with an endpoint in the interface. The function resets the data toggle and clears the stall condition on a pipe
- **Abort Pipe:** To abort transfers on the pipe associated with an endpoint in the interface. The function aborts all the pending transfers for a pipe.
- **Reset Device:** The application sends the USB vendor command to reset the device on the control endpoint interface. Device gets re-enumerated after the operation.
- **Clear Log:** Clears the log contains in the **Log** window.

4 EZ-USB™ FX Control Center GUI

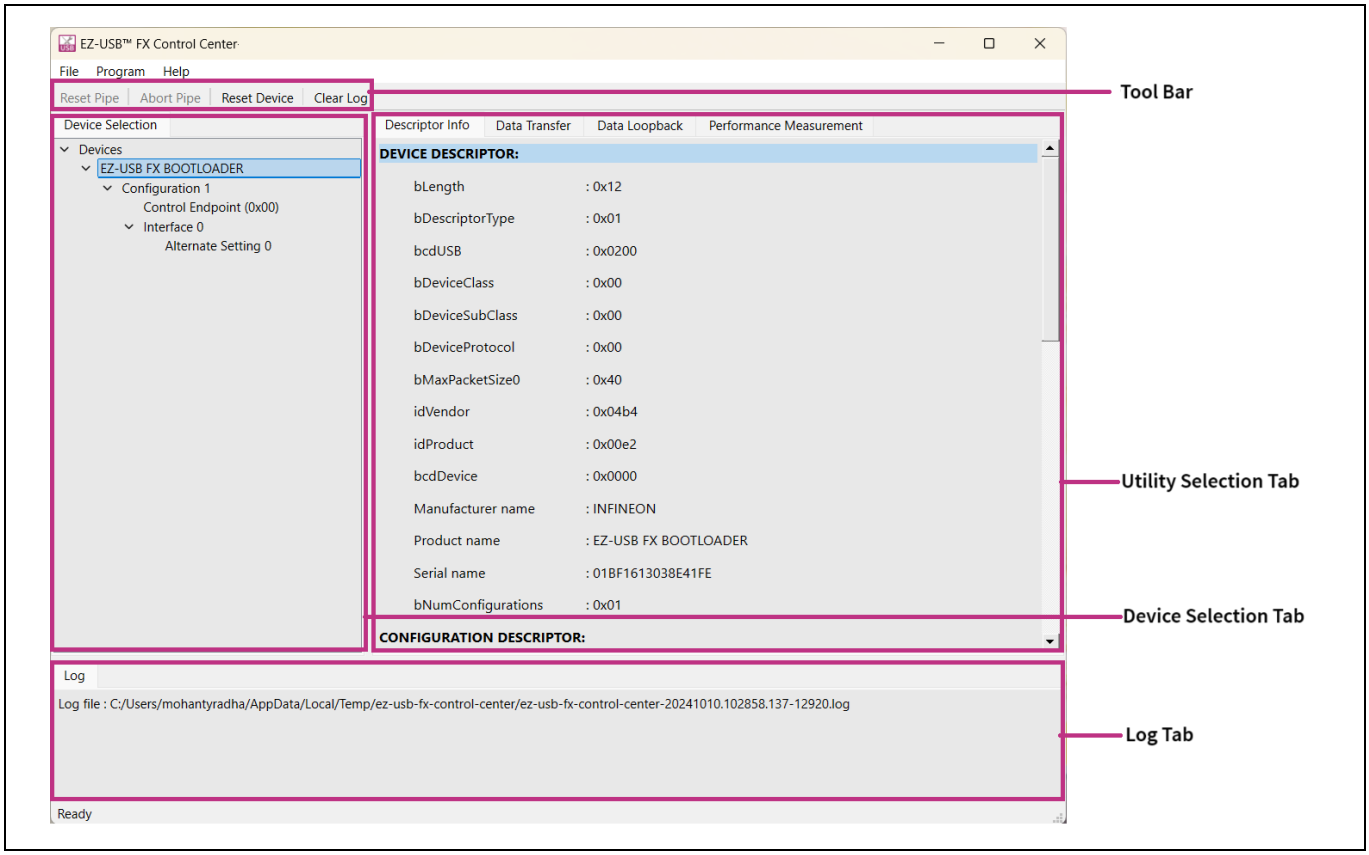

Figure 8 GUI main screen

The EZ-USB™ FX Control Center GUI displays the following tabs:

1. **Tool bar:** Displays **Reset Pipe**, **Abort Pipe**, **Reset Device**, and **Clear Log** tabs.
2. **Device Selection tab:** Displays all connected EZ-USB™ FX devices matching the supported Globally unique identifier {01234567-2A4F-49EE-8DD3-FADEA377234A} and Vendor ID {04B4}. The devices are listed under the 'Devices' tree. This list is automatically updated when anEZ-USB™ FX device is attached and detached.
3. **Utility tabs:**
   a) **Descriptor Information** – The entire descriptor information of the EZ-USB™ FX device.
   b) **Data Transfer** –Data transfer on the selected endpoint.
   c) **Data Loopback** – Loopback on selected endpoint pairs from the selected EZ-USB™ FX device alternate setting.
   d) **Performance Measurement** – Throughput measurement of the endpoint of the EZ-USB™ FX device.
   e) **Programming Device** – Programming the selected EZ-USB™ FX device.
4. **Log tab:** Contains any messages (operation started, operation completed, any error messages encountered, etc.) that the application wishes to display.

4.1 Descriptor Information tab

The selected device descriptor is displayed on the window on the right. Depending on the selection in the **Device Selection** tab panel, the respective descriptor will be displayed.

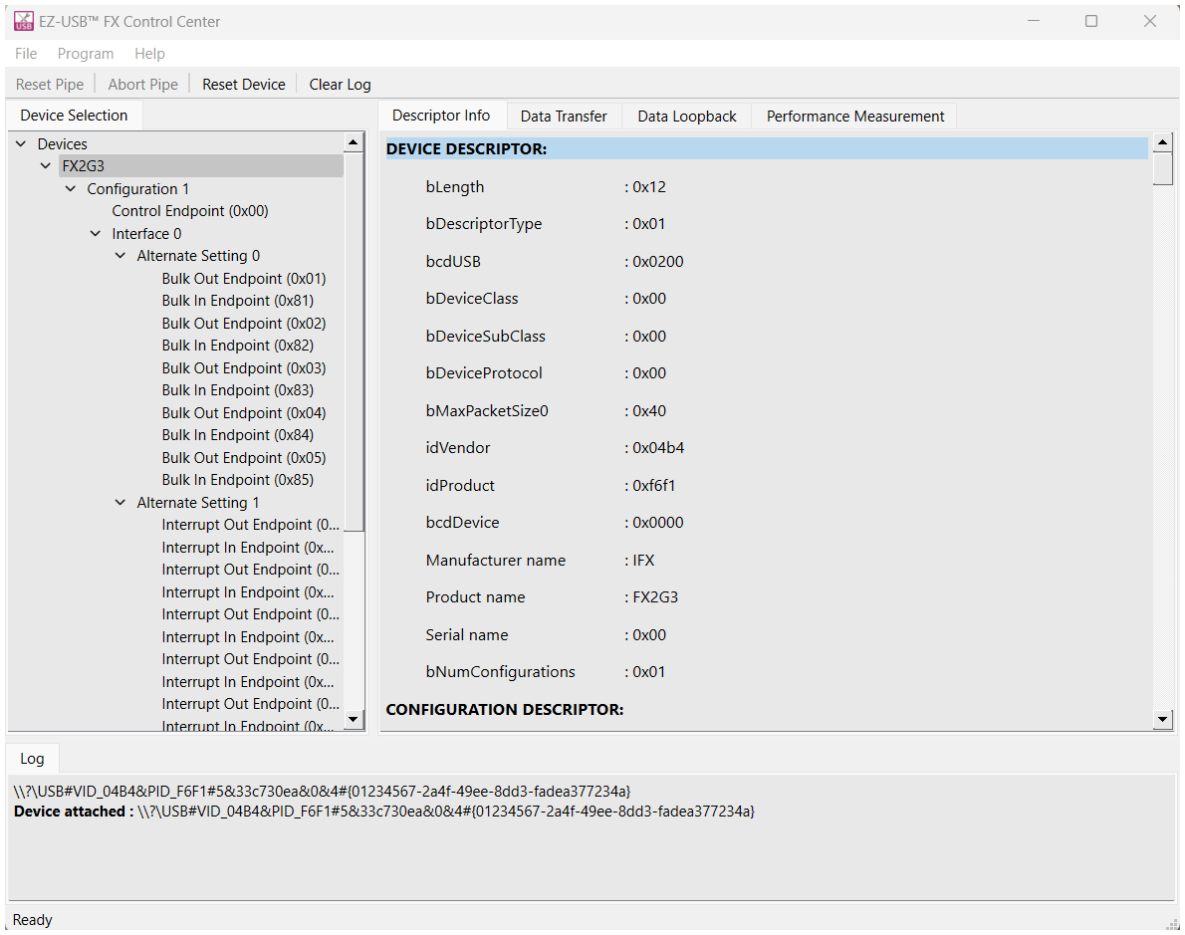

Figure 9 Descriptor Information tab

4.2 Data Transfer tab

The **Data Transfer** tab displays various parameters:

1. Indicates whether the data is to be sent to the device (OUT) or read from the device (IN) using the Direction combo box.
2. Indicates the type of request (Standard, Class, or Vendor) using the Request Type combo box.
3. Indicates the target (Device, interface, endpoint, or others) of transfer using the Target combo box.
4. Enter the byte representing the vendor request command code in the **bRequest** field.
5. Enter the 2-byte hexadecimal value for the vendor request's **wValue** parameter in the wValue field.
6. Enter the 2-byte hexadecimal value for the vendor request's **wIndex** parameter in the wIndex field.
7. If the direction is OUT, fill the data to be sent in the "Text to send" field. If the direction is IN, fill the "**Bytes to Transfer**" field with the size of data expected from thedevice and initiate the transfer using **Transfer Data** button.

The 'Packet mode' feature enables the application to split the transferred data into packets whose size is defined by the **MaxPacketSize** parameter of the request on endpoint.

EZ-USB™ FX Control Center GUI

Example: User request length is 2048 bytes on bulk OUT endpoint and the **MaxPacketsize** of endpoint is 1024 bytes.

- If the "**Packet mode**" option is enabled, the application will send data in two requests. The length of each request will be of **MaxPacketSize**.
- If the "**Packet mode**" option is disabled, the application will send data in one request.
- Clear Box clears the output box

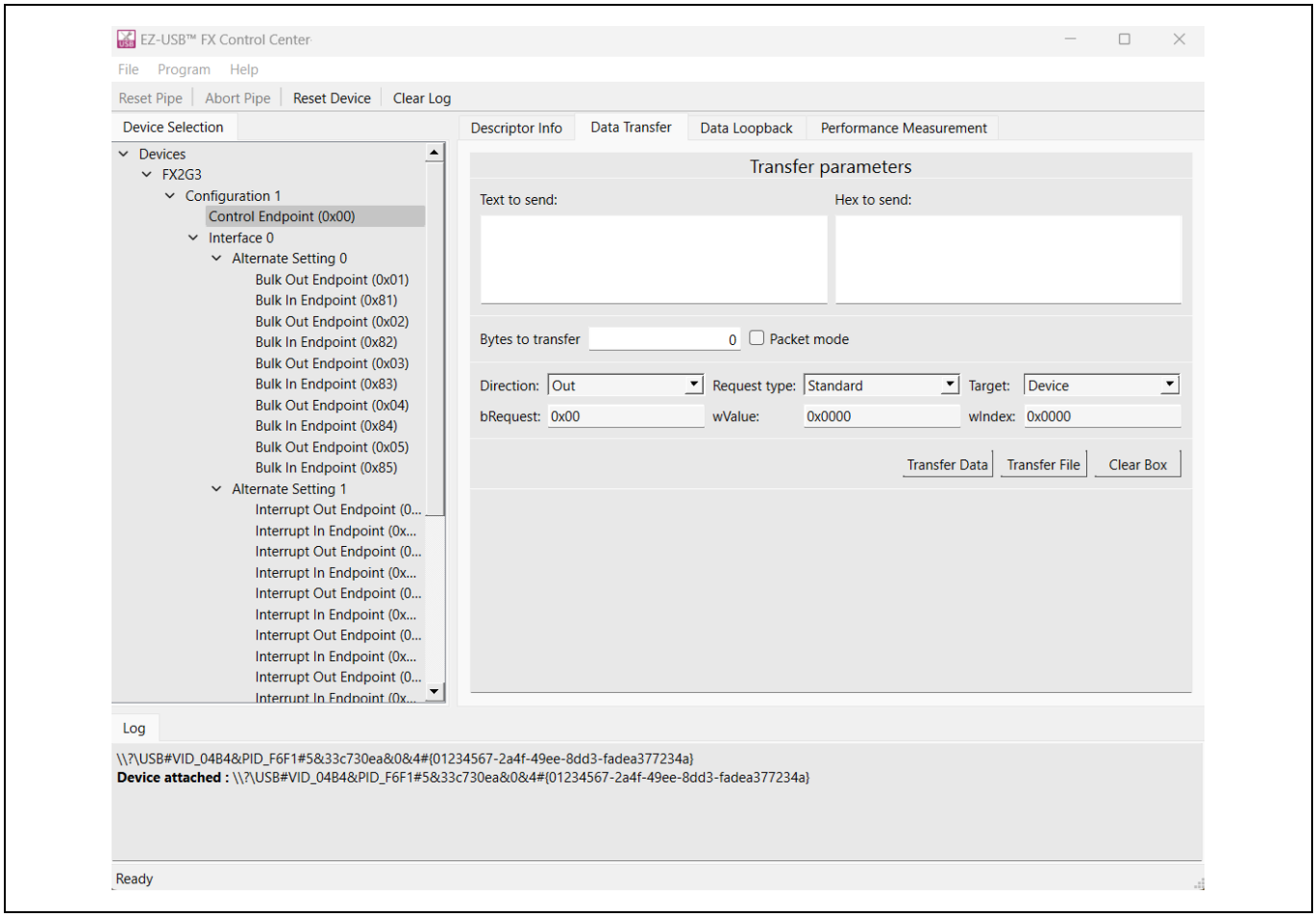

Figure 10 Control Endpoint transfer tab

Similarly, Data/File transfer over Bulk, Interrupt and Isochronous endpoints (Figure 11). Depending on the transfer direction, the read or write call will be performed.

1. Click the **Transfer Data** button to perform the following actions. The received and sent data is displayed in the display box.
   - Receive a specified number of bytes (if in the IN endpoint)
   - Sends the data filled in "**Text to send**" field
   - Sends NULL data of a specified number of bytes (if for the OUT endpoint)
2. Click the **Transfer File** button to perform the following actions:
   - Receive a specified number of bytes (if in the IN endpoint) and save into provided file.
   - Send the data from the selected file (if in the OUT endpoint)

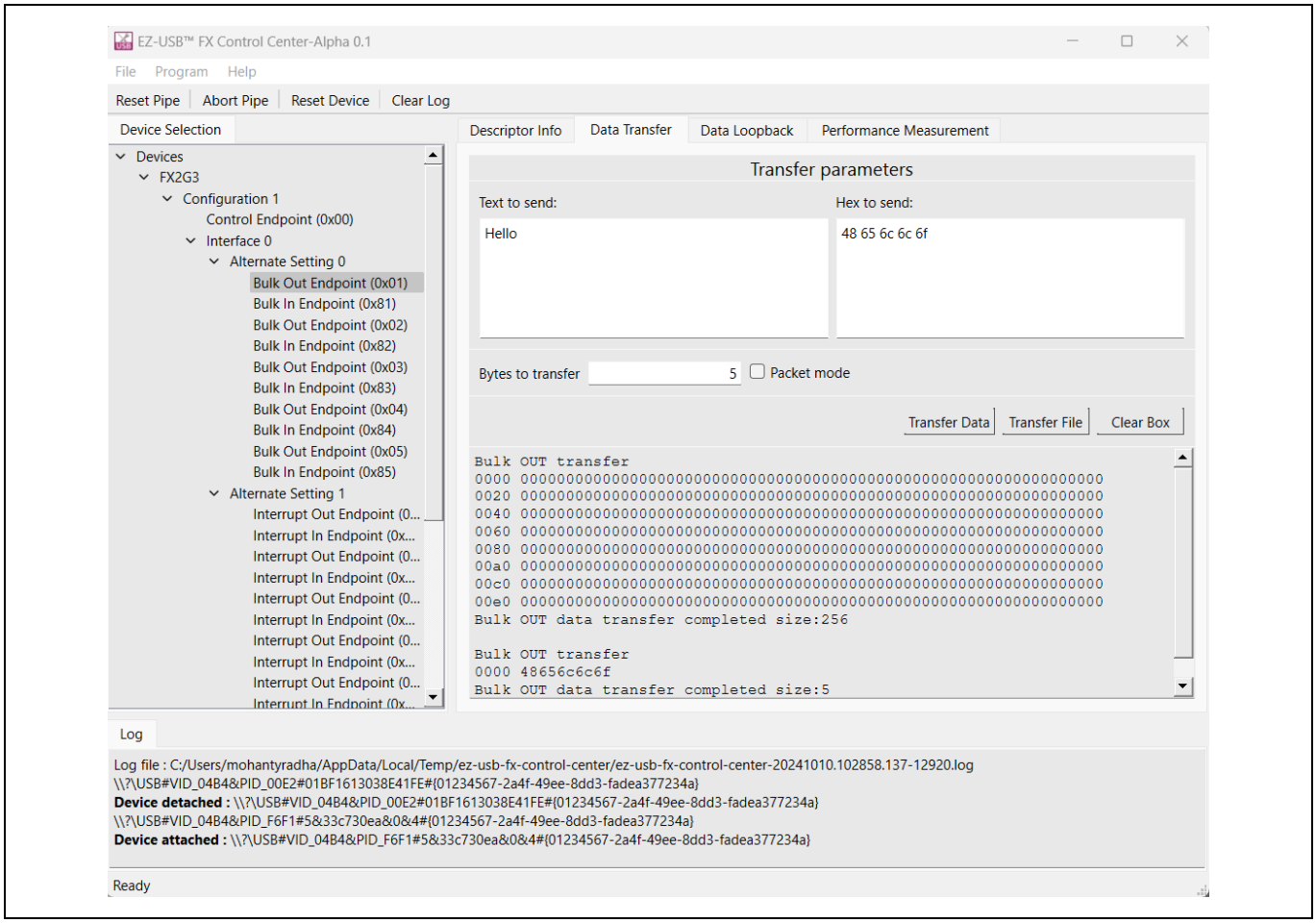

Figure 11 Data Endpoint transfer tab

4.3 Data Loopback tab

Endpoints are populated for a selected **Alternate Setting**. If the device is selected from the **Device Selection** pane, the first **Alternate Settings** endpoint pairs are populated. If any endpoint is selected from the **Device Selection** pane, the corresponding Alternate Setting's endpoints pairs are displayed.

*Note: Click the **Start** button to start the loopback operation. Click the **Stop** button to stop the operation.*

The following is performed during data loopback:

- Loopback is performed over a pair of endpoints. This is a synchronous transfer.
- Data is first sent over the OUT endpoint and then read back from the IN endpoint. The data read is compared against the data written.
- Success and failure of the transfer depends on the data comparison between the endpoints.
- You can send four types of data:
  - Constant data
  - Random data
  - Incrementing byte
  - Incrementing a 32-bit integer
- The size of each transfer is equal to MaxBurst * MaxBytesPerInterval.

- You can select the endpoints in the tool and then start and stop the transfer using the **Start**/**Stop** button. The number of successful and failed transfers is updated at runtime.
- The total number of bytes successfully read and written on endpoints is mentioned in the tool.

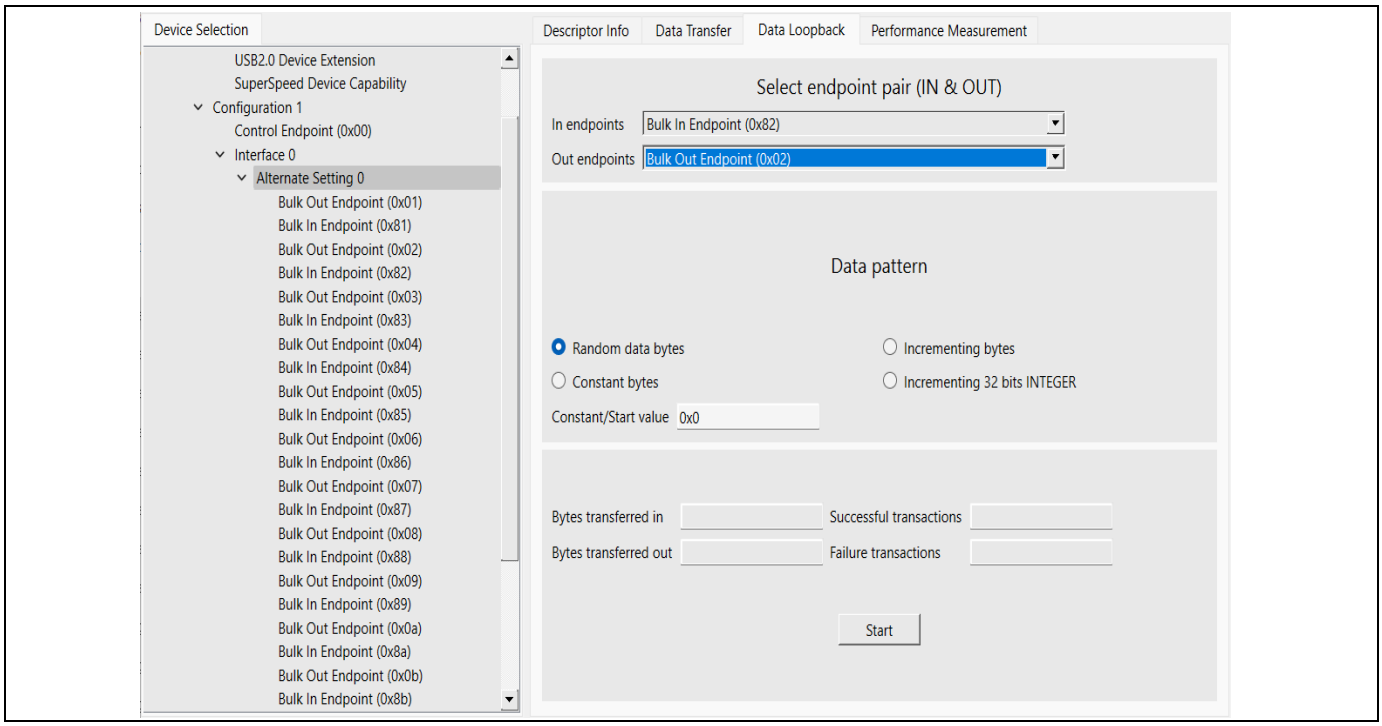

Figure 12 Data Loopback window

4.4 Performance Measurement tab

Performance measurement is an asynchronous bulk/isochronous transfer operation. The following takes place in the **Performance Measurement** tab:

- Based on the Attributes field of the endpoint descriptor, bulk or isochronous transfer is performed.
- You can enter the queue size and packets per transfer.
- The total number of bytes transferred is successively added during each transfer and used for transfer rate calculation. The Transfer rate (KBps)or Transfer rate (MBps) will be displayed based on the endpoint transfer rate.

EZ-USB™ FX Control Center GUI

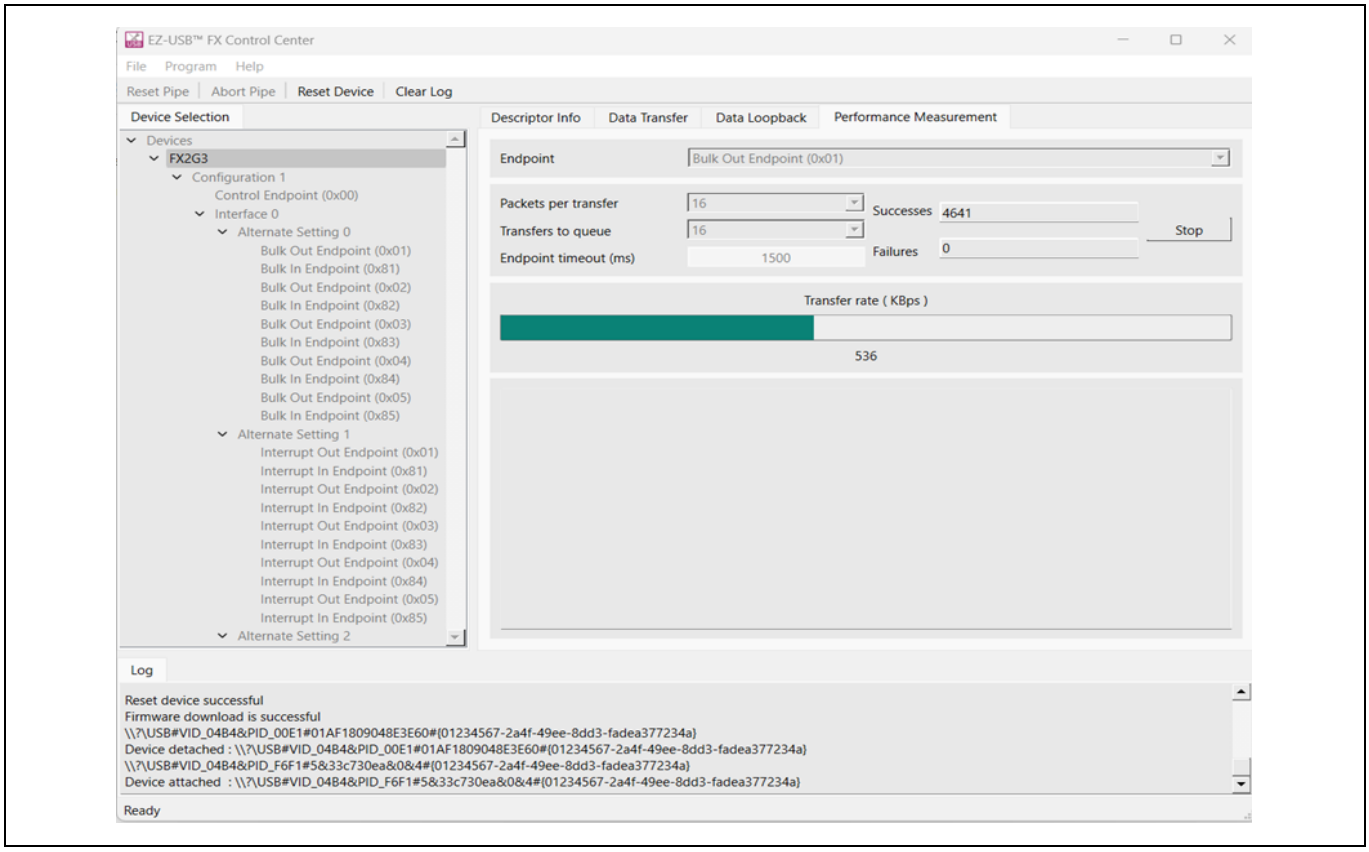

Figure 13 Performance Measurement tab

5 Programming the device

5.1 Internal flash

1. To download the internal flash, ensure that the EZ-USB™ FX device is in bootloader mode before programming the device. Do one of the following:
   - Press the PMODE switch and then reset the board using the RESET switch.

   Or
   - Press the PMODE switch and then power-cycle the board by unplugging it and plugging it back in.

Firmware download:

1. Navigate to **Program** > **Internal Flash** from the menu bar to download the firmware *.hex* file to the EZ-USB™ FX device's device internal flash.
2. Choose the firmware *.hex* file using the browse window.
   Download progress is shown in the pop-up box (Figure 14).

After the firmware is successfully downloaded, the device is reset. The device is reconnected with the programmed application.

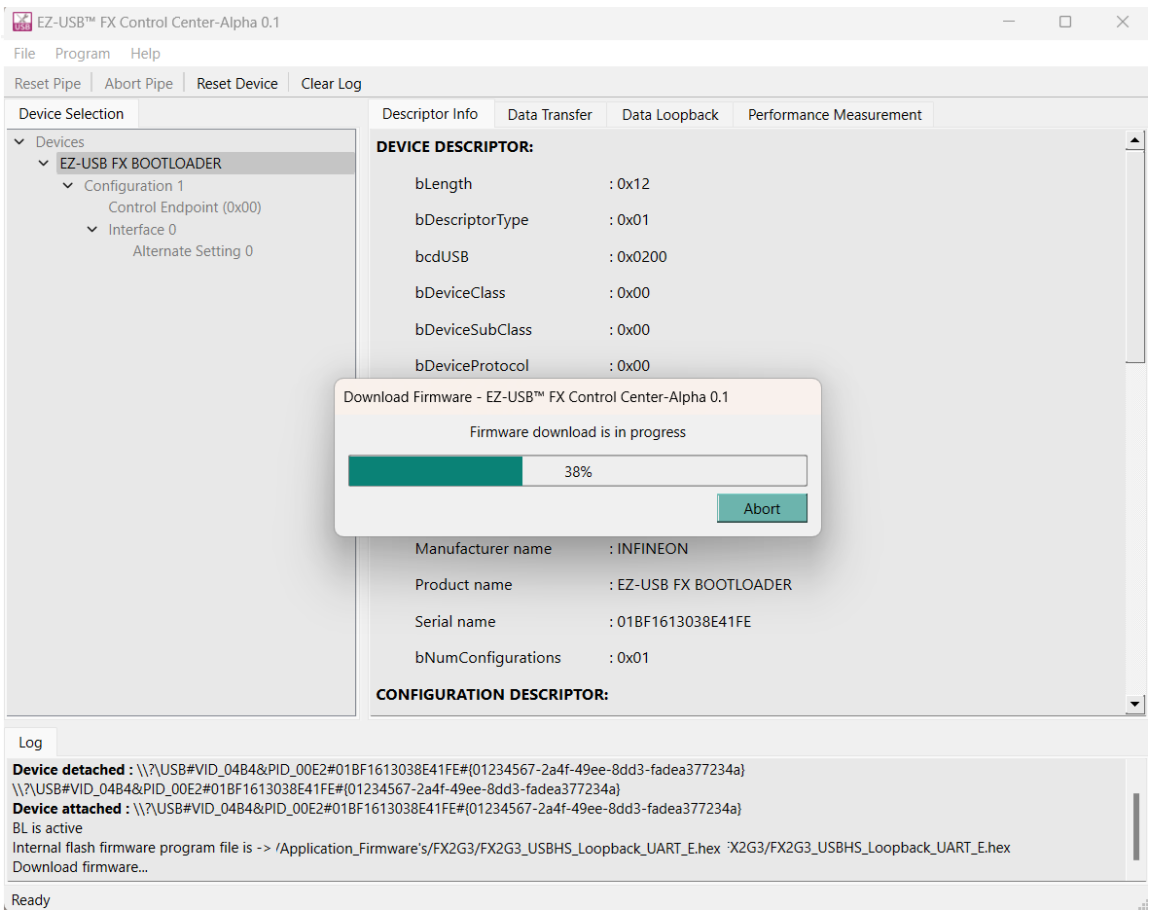

Figure 14 Internal flash programming

5.2 External SPI flash

1. To download the external SPI flash, ensure that the EZ-USB™ FX device is in bootloader mode before programming the device. Do one of the following:
   - Press the PMODE switch and then reset the board using the RESET switch.

   Or
   - Press the PMODE switch and then power-cycle the board by unplugging it and plugging it back in.

Perquisite for FX2G3 only:

Once the FX device is in bootloader mode, program the *mtb-example-fx2g3-flash-loader.hex* file into the Internal flash. The hex file is available in EZ-USB™ FX2G3 SDK.

Download the firmware:

1. Navigate to **Program** > **External SPI flash** in the menu bar to download a binary file (*.bit* or *.bin*) to the external SPI flash memory.
2. Choose the .bin/.bit file using the browse window.
   SPI sector erase download progress is shown in the pop-up box (Figure 15).

After erase operation is successfully completed, external SPI flash download progress is shown in the pop-up box.

Note: The external SPI flash operation does not reset the device.

Programming the device

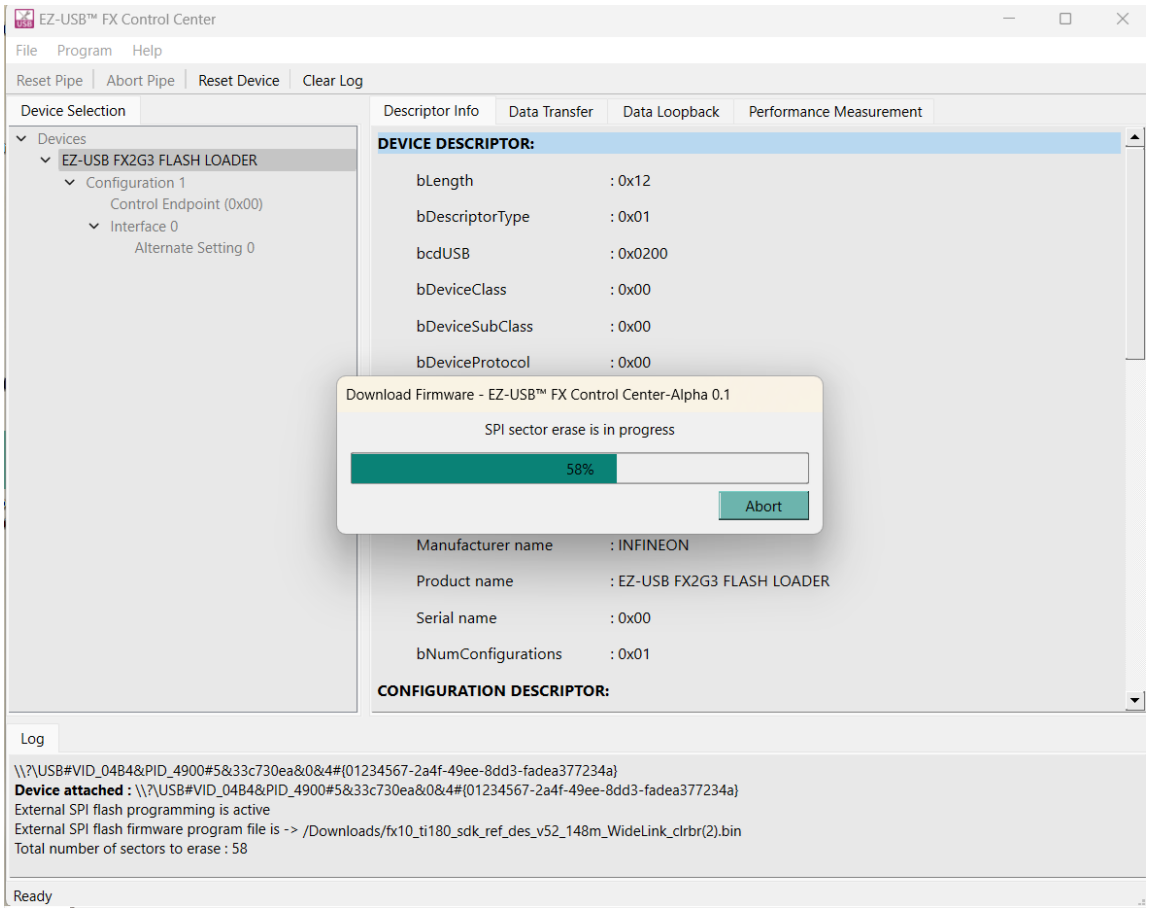

Figure 15 External SPI sector erase progress

Programming the device

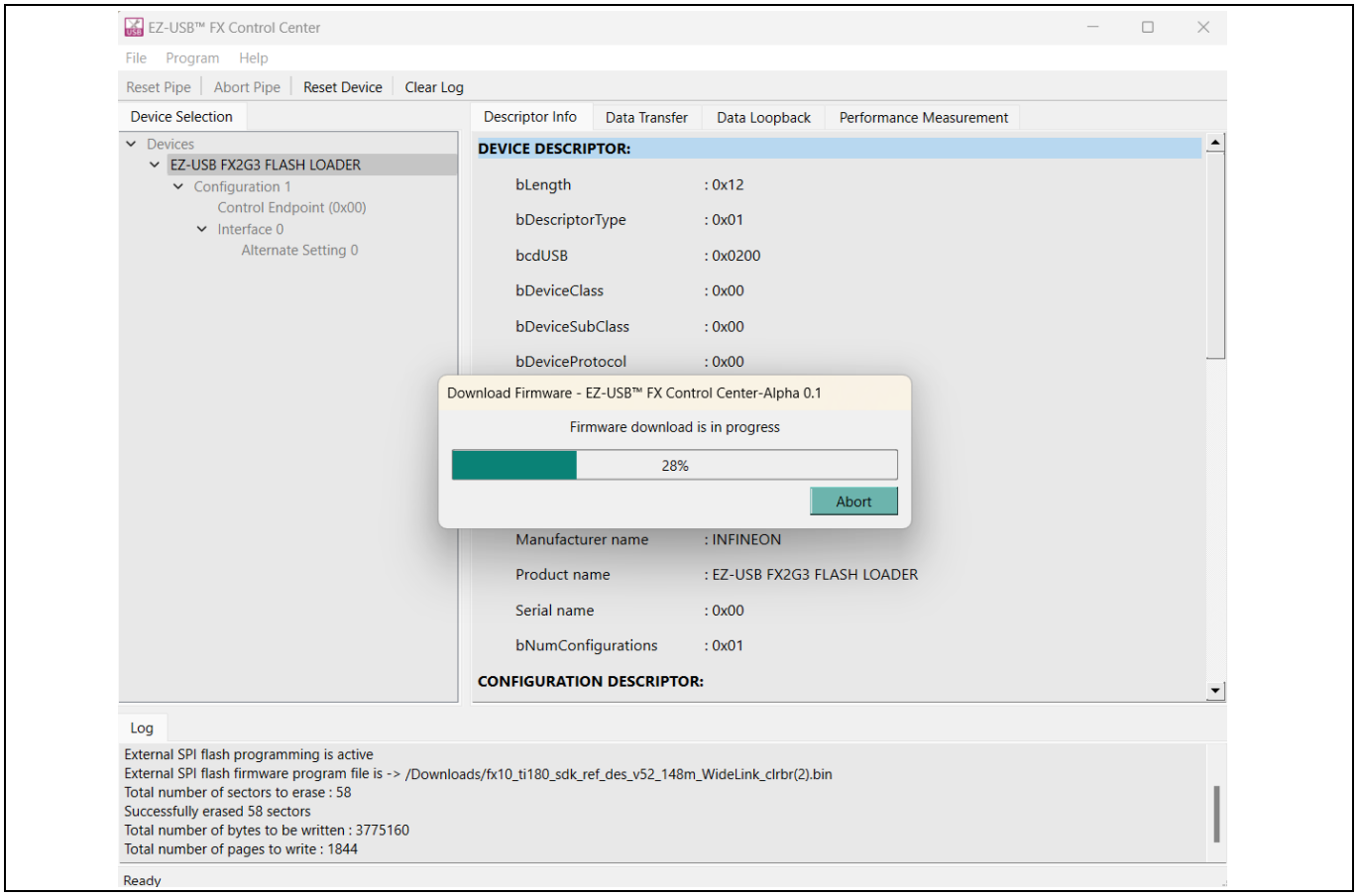

Figure 16 External SPI flash download window

The external flash programming feature of EZ-USB™ FX Control Center can be verified on Infineon S25FS and S25FL flash parts.

The control center appends a fixed number of metadata bytes at the beginning of the external flash. These metadata bytes have information about the programmed external flash file. The external flash file is placed after this metadata region.

Table 2 shows the structure of the metadata region. Offset and size region are little-endian.

Table 2 Metadata schema

Start signature (4 bytes)	File offset (4 bytes)	Firmware file size (4 bytes)	Reserve (4 bytes)	Reserve (4 bytes)	End signature (4 bytes)
{'I','F','X','#'}	Size of metadata region = 24	Size of the firmware file in bytes	Fill with zeros	Fill with zeros	{'I','F','X','$'}

6 Troubleshooting

Table 3 Troubleshooting scenarios

FX device enumeration	
Feature	FX device Enumeration
Error message	WinUSB device is enumerated in Device Manager, but not listed in the Control Center tool's device tree list in left pane.
Reason	**This error is observed if:** `Missing DeviceInterfaceGUID {01234567-2A4F-49EE-8DD3-FADEA377234A}` entry in Windows OS Registry Editor.
Solution	Add the **DeviceInterfaceGUID** key value as **{01234567-2A4F-49EE-8DD3-FADEA377234A}** under the following path: Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\USB\VID_xxxx&PID_xxxx\<serial_string>\Device Parameters To find the serial_string value, perform the following steps: 1. Open **Device Manager**. 2. Right-click the USB device and select **Properties**. 3. Go to the **Details** tab. 4. Choose **Device Instance Path** from the **Property** drop-down. The value displayed will include the vendor ID, product ID, and serial string. For example, in USB\VID_04B4&PID_XXXX\5&33C730EA&0&4, the serial string is 5&33C730EA&0&4.
Program feature	
Feature	Program feature
Error message	Boot loader is not active for the selected device.
Reason	**This error is observed if:** The device is not in bootloader mode.
Solution	Ensure that the EZ-USB™ FX device is in the bootloader mode before programming. There are two methods to achieve this: • Press the PMODE switch and reset the board using the RESET switch. • Press the PMODE switch and power-cycle the board by unplugging it and plugging it back in.

Revision history

Document revision	Date	Description of changes
**	2024-10-15	Initial release

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