EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC) guide

About this document

Scope and purpose

The EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC) enables the development of applications based on the EZ-USB™ FX2G3 USB 2.0 Hi-Speed (HS) device controller (CYUSB2315/CYUSB2316/CYUSB2317/CYUSB2318) for seamless integration of USB Hi-Speed devices to a host.

Infineon CYUSB2315/CYUSB2316/CYUSB2317/CYUSB2318 devices are referred as EZ-USB™ FX2G3 in this document.

Intended audience

This document is intended for the users of the EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC).

About this product group

Target applications

- Biometric devices
- Scanners
- Medical devices
- Video streaming cameras
- Audio devices
- Industrial automation
- Data acquisition systems
- USB logic and protocol analyzers, JTAG debuggers
- USB smartphone add-on accessories

Product family

EZ-USB™ FX2G3 (CYUSB2315, CYUSB2316, CYUSB2317, CYUSB2318) is a family of the next-generation, highly integrated USB 2.0 controllers serving as the basis for any 480 Mbps USB peripheral device. With dual-core architecture, USB-C integration, broad compatibility for serial interfaces, and comprehensive development support, EZ-USB™ FX2G3 is the one-stop solution for USB 2.0 connectivity.

Safety precautions

Note: *Please note the following warnings regarding the hazards associated with development systems.*

Table 1 Safety precautions

	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*

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1 Introduction

The EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC) is based on Infineon's EZ-USB™ FX2G3 USB 2.0 device controllers.

EZ-USB™ FX2G3 is a family of USB 2.0 device controllers targeting the established USB 2.0 applications in the biometric scanner, camera, video, and imaging markets. It is based on the MXS40-LP platform with Cortex®-M4 and M0+ MCUs, 512 KB flash, 128 KB SRAM, 128 KB ROM, Serial Communication Blocks (SCB), and a crypto engine to support various security features. A high-bandwidth data subsystem provides DMA data transfers from LVCMOS input to USB output at speeds up to 480 Mbps, USB Hi-Speed based host systems. A 1024 KB SRAM is included in the high-bandwidth data subsystem to provide buffering for data. EZ-USB™ FX2G3 will replace the FX2LP USB HS controllers by incorporating most of its features and adding new ones.

See the device datasheet to understand and compare the various features supported by EZ-USB™ FX2G3 controllers.

The EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC) supports the following key features:

- Stream video from an external camera interface, which supports parallel data and audio from onboard stereo microphones to a USB 2.0 host
- USB bus-powered and self-powered operation
- CAN transceiver to interface with external CAN devices

For EZ-USB™ FX2G3 controller details, see the EZ-USB™ FX2G3 kit webpage.

1.1 Explorer Kit contents

Table 2 lists the EZ-USB™ FX2G3 Explorer Kit (KIT_FX2G3_LC) contents.

Table 2 Kit contents

Item	Type	Note
EZ-USB™ FX2G3 baseboard	Hardware	–
USB 2.0 Type-C cable	Cable	–
Kit casing	Package	–
Foam	Package	To protect and maintain proper placement in the kit container

Note: QSG is available as QR code on the kit casing.

1.2 Download kit documents and hardware design files

Download the KIT_FX2G3_LC kit documents and the hardware design files from the EZ-USB™ FX2G3 kit webpage. The documents include a QSG, kit user guide (this document), and release notes. The hardware design files include schematic, bill of materials (BOM), and layout files.

2 Installing the kit software

Install the necessary software before proceeding.

Note: The installation of the following software may require administrator privileges.

- Download and install the ModusToolbox™ software
- Download the latest version of the EZ-USB™ Control Center application from the official Infineon website
- Download and install a serial terminal application such as Tera Term for observing debug prints

3 KIT_FX2G3_LC system design

The EZ-USB™ FX2G3 board is bus-/self-powered and supports a USB-C 480 Mbps cable to connect to the PC.

3.1 Top-level hardware design

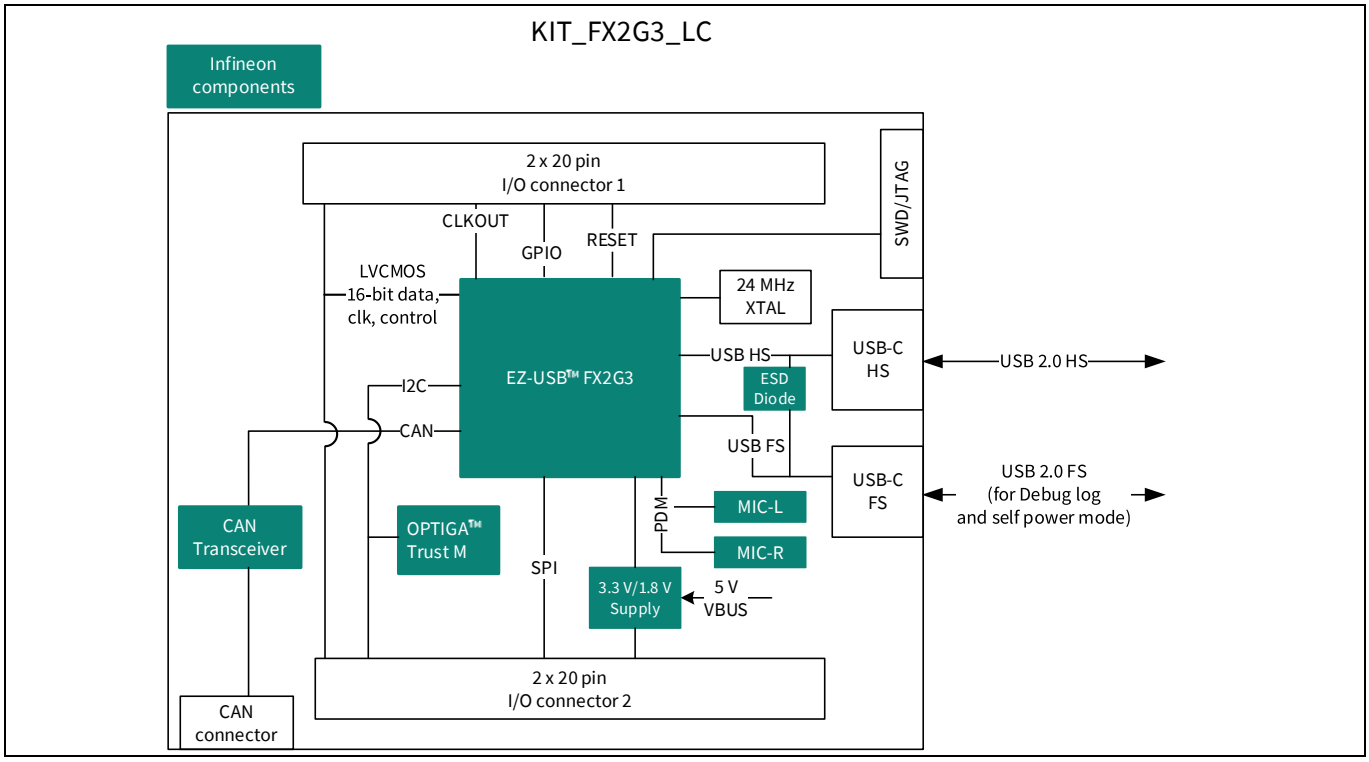
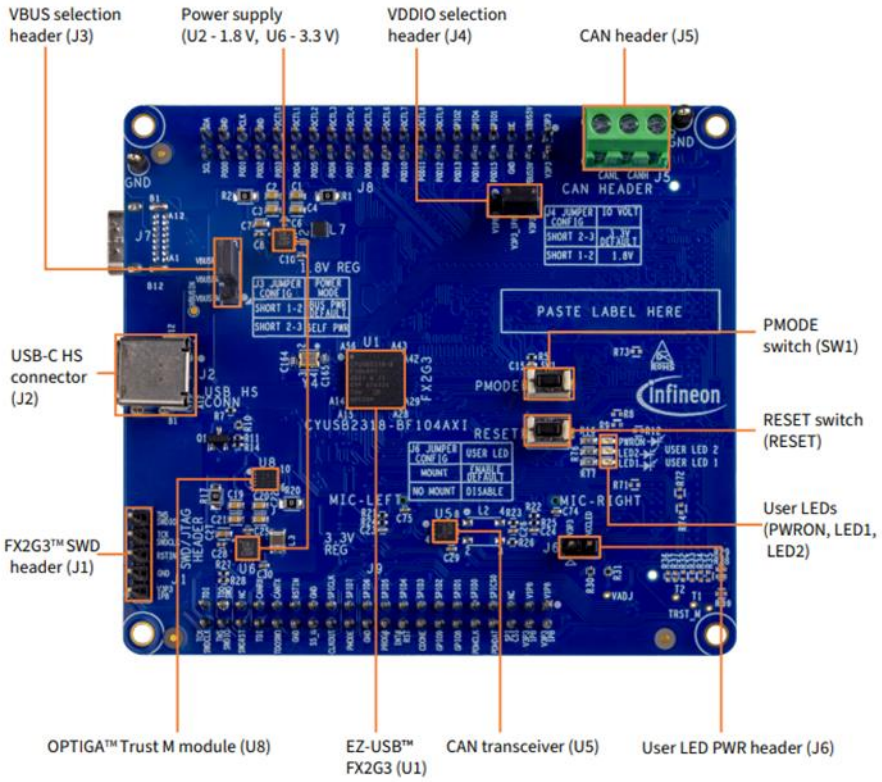
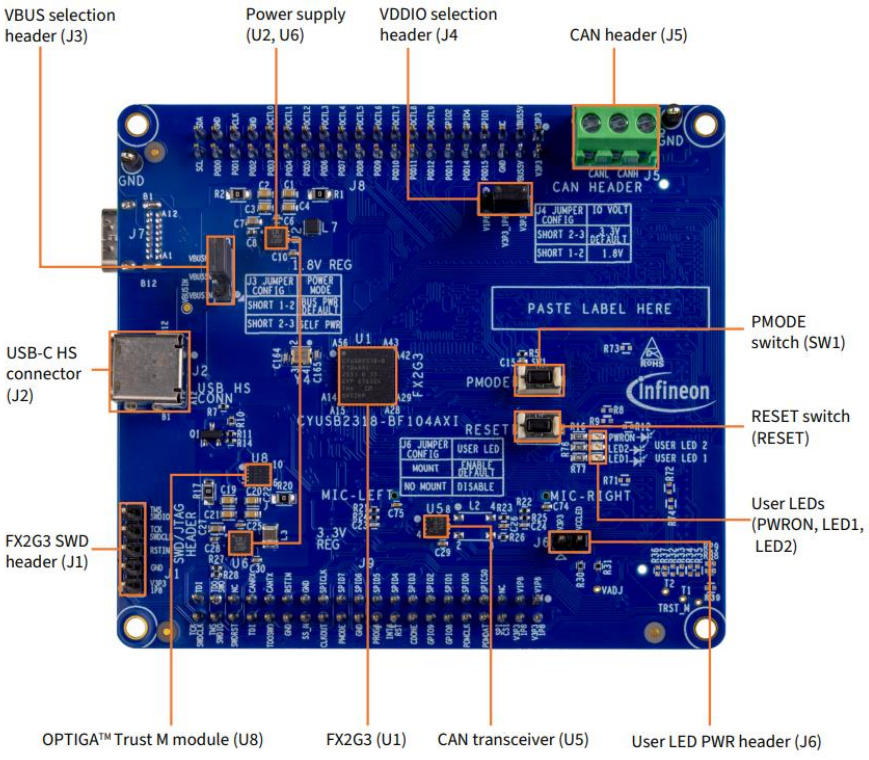


Figure 1 EZ-USB™ FX2G3 Explorer Kit block diagram

3.2 KIT_FX2G3_LC EZ-USB™ FX2G3 Explorer Kit design details

3.2.1 EZ-USB™ FX2G3 Explorer Kit





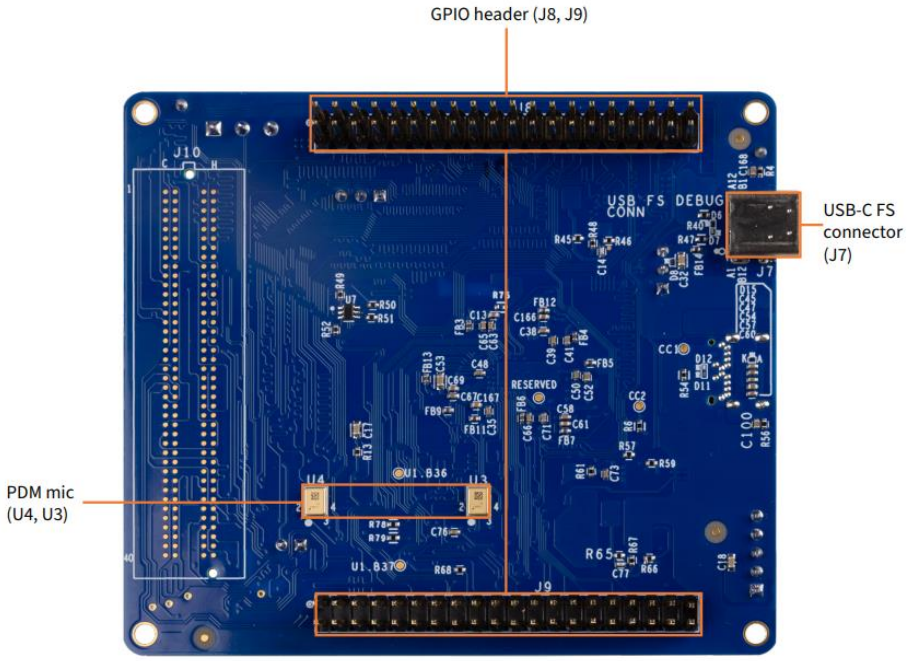


Figure 2 EZ-USB™ FX2G3 Explorer Kit

3.2.1.1 EZ-USB™ FX2G3 Explorer Kit features

The EZ-USB™ FX2G3 Explorer Kit baseboard has the following components/interfaces:

- EZ-USB™ FX2G3 controller
- One power-on LED and two user LEDs
- Boot mode for selecting USB boot or SPI boot
- Reset switch to reset the device
- Two PDM microphones in stereo configuration
- CAN transceiver and connector
- Hi-Speed (HS) USB port for data transfers at speeds up to 480 Mbps
- Full Speed (FS) USB port for data logging
- Onboard regulators: 1.8 V and 3.3 V DC-DC switching regulators
- Jumper to select between 1.8 V and 3.3 V I/O voltage
- Jumper to select self-power or bus power mode
- 2x 40-pin GPIO header for interfacing FPGA add-on board
- SWD header

3.2.1.2 USB-C HS connector (J2)

The KIT_FX2G3_LC kit is bus-/self-powered and uses a USB-C connector to interface with the PC through a USB-C 480 Mbps cable. The latter serves both power and data transfer from the PC. The USB 2.0 port of the PC can source a maximum of 5 V at 3 A power through VBUS. This interface has TVS diodes for protection against ESD.

3.2.1.3 USB-C Full-Speed connector (J7)

EZ-USB™ FX2G3 has a debug access port (DAP) that acts as the interface for device programming and debugging. An external programmer or debugger (the “host”) communicates with the DAP through the device Serial Wire Debug (SWD) or Joint Test Action Group (JTAG) interface pins through the USB-C Full-Speed connector. This port is used for message logging in the kit.

3.2.1.4 Self or bus power mode selection header (J3)

Jumper J3 is a 3-pin header that can be used to switch the device power supply between self-powered or bus powered mode. Shorting the 1-2 pins in these jumpers will set the device to power from the USB-C HS connector (J2), thus enabling bus-powered mode. Shorting pins 2-3 will set the device into self-powered mode. In this mode, you should connect an external power supply adapter to the USB-C FS connector (J7) while connecting to the host via the USB-C HS connector (J2).

Table 3 Explorer Kit jumper settings

Name	Jumper	Short 1-2	Short 2-3
VBUS_5V	J3	Bus power (powered from USB-C HS connector, J2)	Self-power (powered from USB-C FS connector, J7)

3.2.1.5 Mode selection switch (SW1)

This switch selects the mode in which EZ-USB™ FX2G3 must boot upon power on. The kit can boot in two modes based on the position of this switch.

Table 4 Boot modes

Boot mode	SW1	Description
USB	Pressed	Hold the push button (SW1) and power cycle the kit either by pressing and releasing the RESET button or by removing and reconnecting the USB-C cable from J2
Internal flash memory	Not pressed	Default mode

3.2.1.6 Power supply

The baseboard consists of two IR3883MTRPBF regulators. It is a DC-DC buck switching regulator rated for 3 A. With a 16-PQFN package, the regulator features overvoltage protection, overcurrent protection, and overtemperature protection. The following voltages are generated from VBUS (i.e., 5 V ± 0.25 V) and the rating of each regulator is:

- U6: 3.3 V ±5% at 3 A
- U2: 1.8 V ± 5% at 3 A

Jumper J4 is a 3-pin header that can be used to switch the VDDIO supply between 1.8 V and 3.3 V. Shorting pins 1-2 will set the voltage at the respective supply pin to 1.8 V. Shorting pins 2-3 will set the voltage at the respective supply pin to 3.3 V.

Table 5 Explorer Kit jumper settings

Name	Jumper	Short 1-2	Short 2-3
V3P3_1P8	J4	1.8 V	3.3 V

3.2.1.7 EZ-USB™ FX2G3 (U1)

EZ-USB™ FX2G3 USB 2.0 Hi-Speed device controller. It is a 480 Mbps device controller with a bandwidth to support USB 2.0 based host systems. It supports UVC, UAC, and USB Vendor Class protocols. The EZ-USB™ FX2G3 Explorer Kit is designed to stream video and audio seamlessly to the USB host using the FPGA add-on boards (refer to KIT_FX2G3_104LGA) and off-the-shelf camera modules. It is a 104-pin, 8×8×1 mm, 0.5 mm pitch LGA package.

3.2.1.8 GPIO connector (J8 and J9)

The baseboard has a 2x 40-pin connector to interface with the FPGA/camera add-on boards. All the signals required for interfacing EZ-USB™ FX2G3 with external camera modules such as LVCMOS, I2C, SPI, JTAG, and GPIOs devices are routed to this connector.

3.2.1.9 SWD header (J1)

This Kit provides an SWD header interface that can be used to program the EZ-USB™ FX2G3 device using an SWD programmer such as MiniProg4 (not provided with the kit).

3.2.1.10 Crystal (Y4)

EZ-USB™ FX2G3 needs a 24 MHz crystal to generate the clock with tolerance of ±10 ppm and drive level of 100 µW.

3.2.1.11 LED (USER_LED, PWRON)

- LED1 and LED2 (user LEDs) are green LEDs connected to GPIO2 and GPIO1 of EZ-USB™ FX2G3 respectively. They are application-/firmware-controlled LEDs used for the FW debugging
- PWRON LED is a green LED that turns ON when the kit is powered

Note: Mount J6 to enable power for the user LEDs.

3.2.1.12 Microphone interface (U3 and U4)

Two IM72D128V01XTMA1 PDM microphones from Infineon are available onboard and interfaced to EZ-USB™ FX2G3 in stereo configuration using the PDM interface.

3.2.1.13 CAN interface (J5)

The interface uses the Infineon TLE9251VLEXUMA1 CAN transceiver IC that terminates on a 3-pin terminal block header allowing users to connect external CAN devices.

4 Programming the kit

KIT_FX2G3_LC is preprogrammed with USBHS Device firmware for data loopback. Follow these steps to change the firmware:

1. Open ModusToolbox™ dashboard and click on **Launch Project Creator**

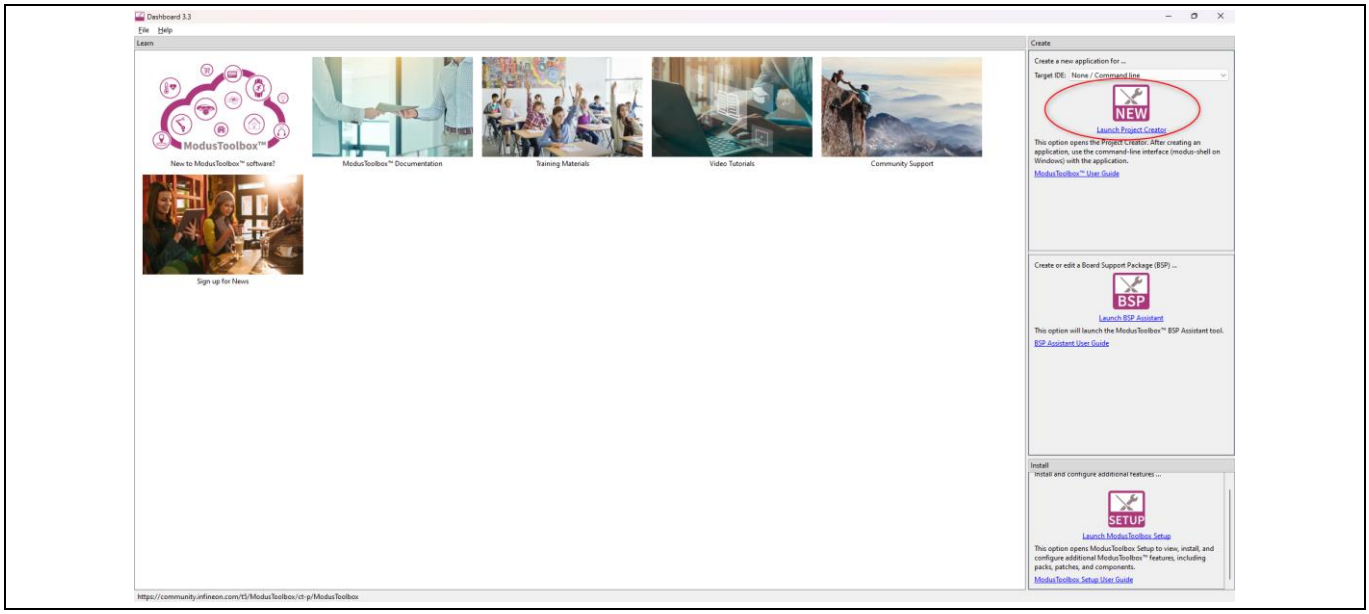


Figure 3 ModusToolbox™ dashboard view

2. Click on **USB BSPs** > **KIT_FX2G3_104LGA** and click **Next**

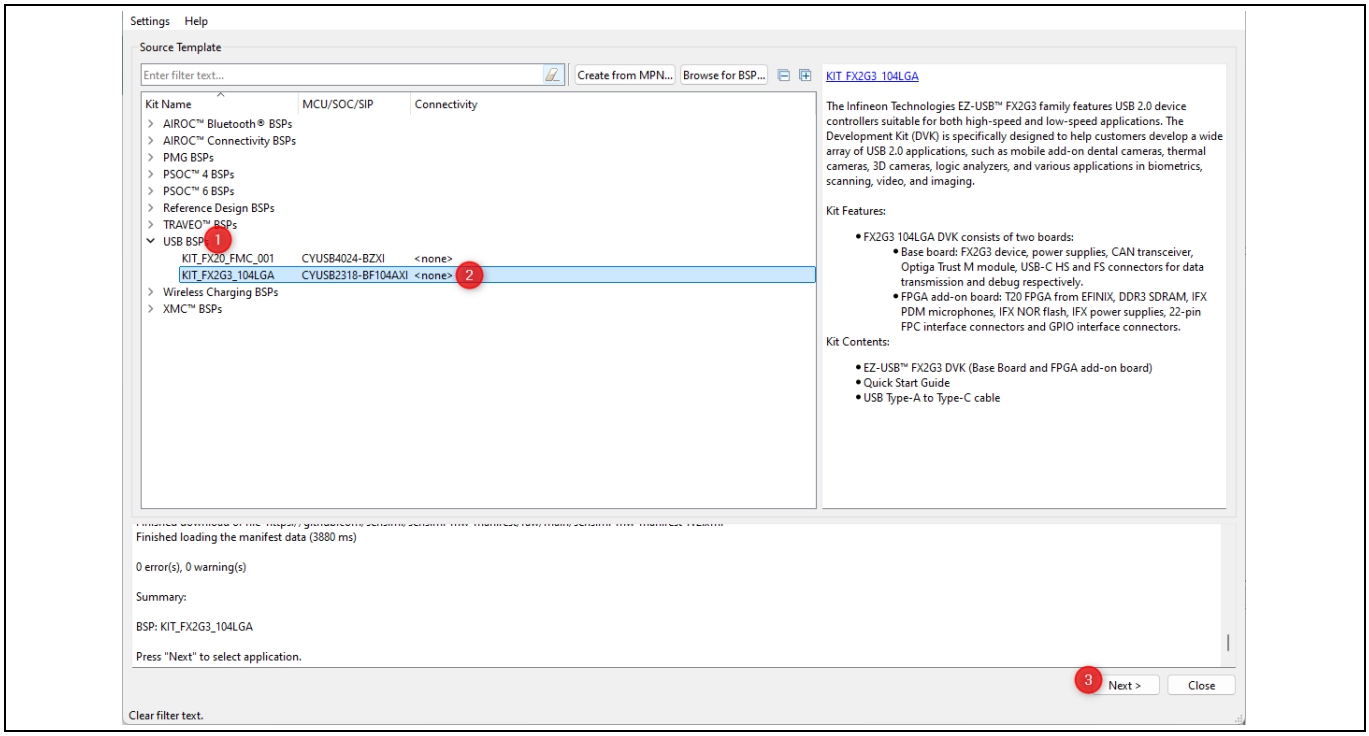


Figure 4 ModusToolbox™ dashboard view

3. In the **Template Application** tab, under **Getting Started and Peripherals**, a list of code examples is available. Select the desired code example and click **Create**

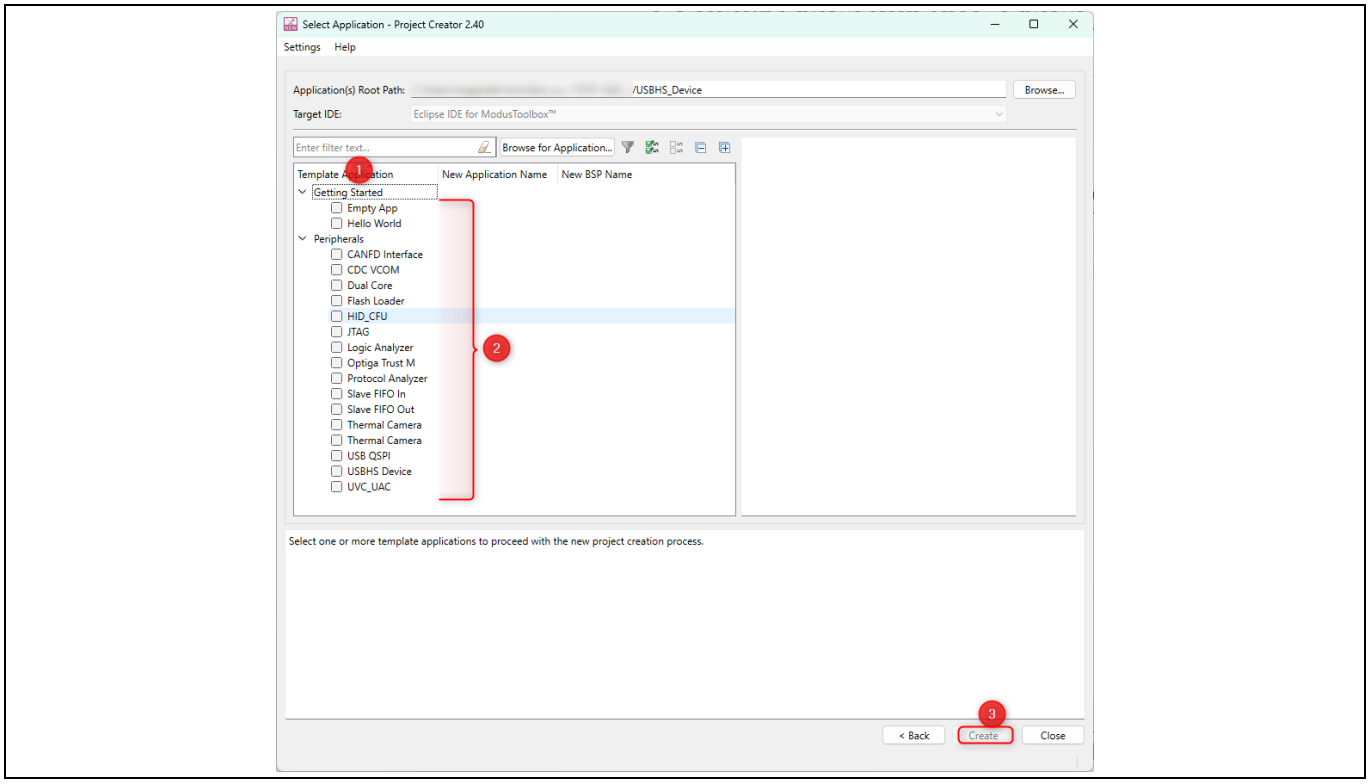


Figure 5 ModusToolbox™ dashboard view

This will create the respective code example folder in the Application(s) Root Path. Navigate to the Application(s) Root Path where the code example is extracted, and then go to the *documents* folder to access the EZ-USB™ FX2G3-SDK user guide. Follow the guide to build the code.

4.1 Program the user application in internal flash

1. Open the *ez-usb-fx-control-center.exe* application
2. Connect the EZ-USB™ FX2G3 Explorer Kit to the PC via a USB-C HS cable
3. Press and hold the PMODE switch (SW1), and then reset the device by pressing the RESET switch. Release the PMODE switch (SW1) after the reset. Wait for the Control Center utility tool to detect the EZ-USB™ FX2G3 device
4. Program the internal flash device as follows:

   a) Select **EZ-USB FX BOOTLOADER**, click **Program**, and then select **Internal Flash F5**, as shown in Figure 6

Programming the kit

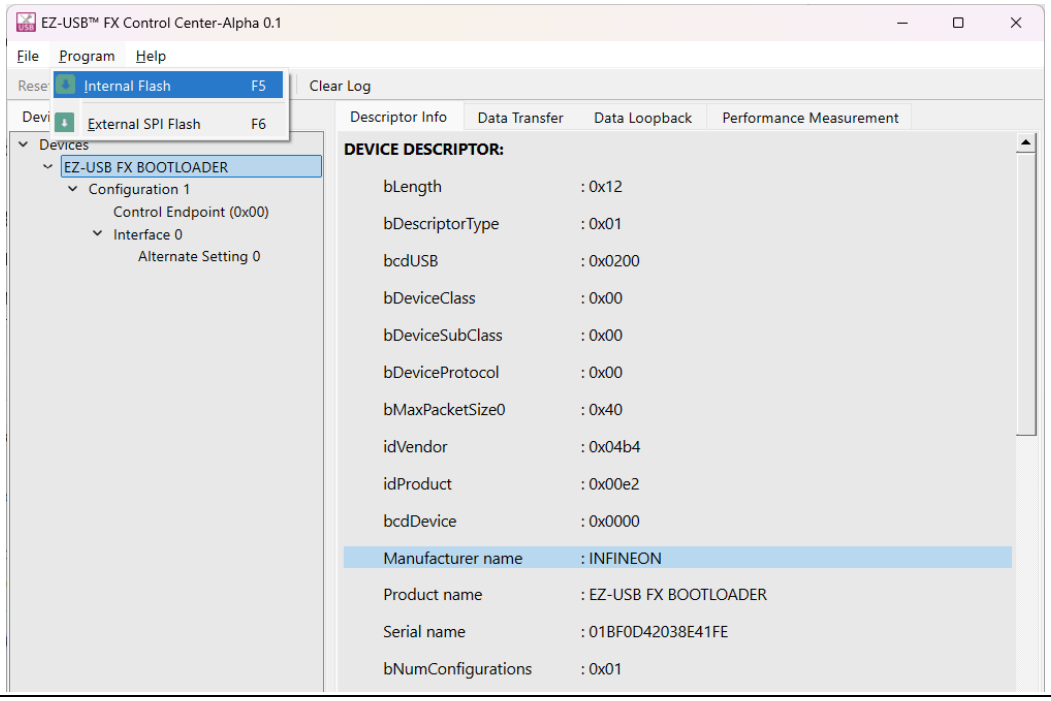


Figure 6 EZ-USB™ FX2G3 device enumeration in Control Center application

5. In the pop-up window, navigate to the *<Drive>\USBHS_Device\build\APP_KIT_FX2G3_104LGA\Release* folder and select the *mtb-example-fx2g3-usbhs-device.hex* file of EZ-USB™ FX2G3, and click **Open** to program the internal flash

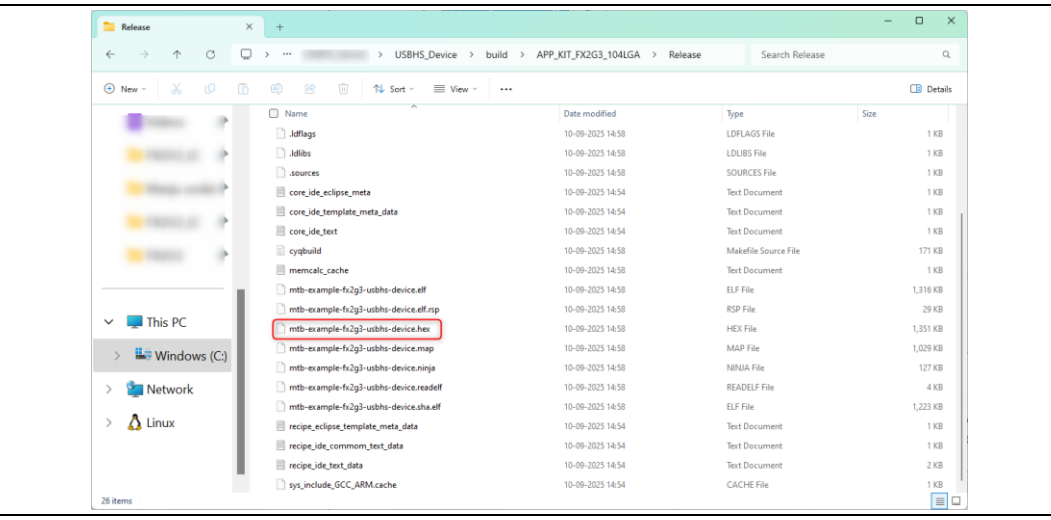


Figure 7 Programming internal SPI flash

Wait for programming to complete. A message will appear indicating that the firmware download is successful and the device is detached.

Programming the kit

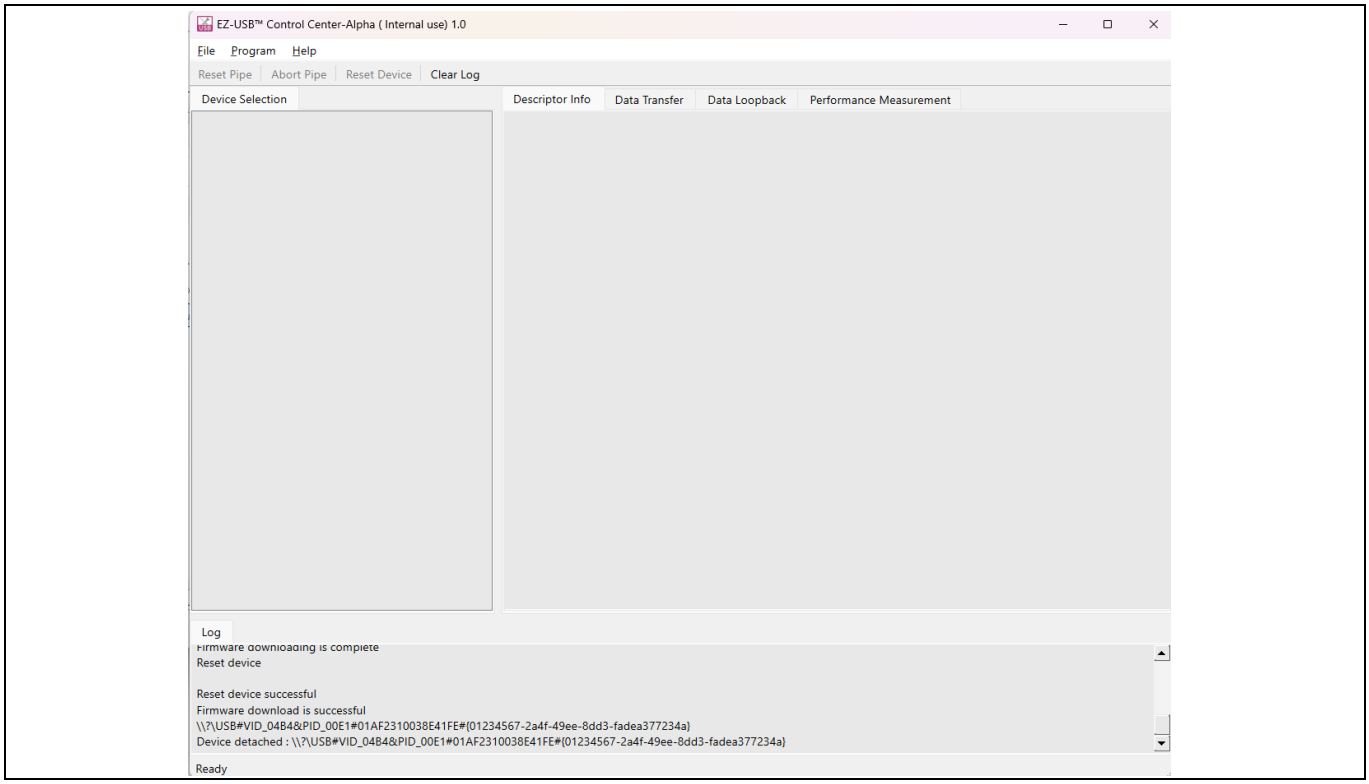


Figure 8 Programming successful Log window

5 Run the application

5.1 Viewing the USBHS data loopback in EZ-USB™ Control Center

1. Ensure that the EZ-USB™ FX2G3 is programmed with the *mtb-example-fx2g3-usbhs-device.hex* file by following the steps mentioned in the Program the user application in internal flash section
2. Connect the kit to the host PC. The device is then enumerated as EZ-USB™ FX2G3 USBHS DEVICE in **Device Manager**

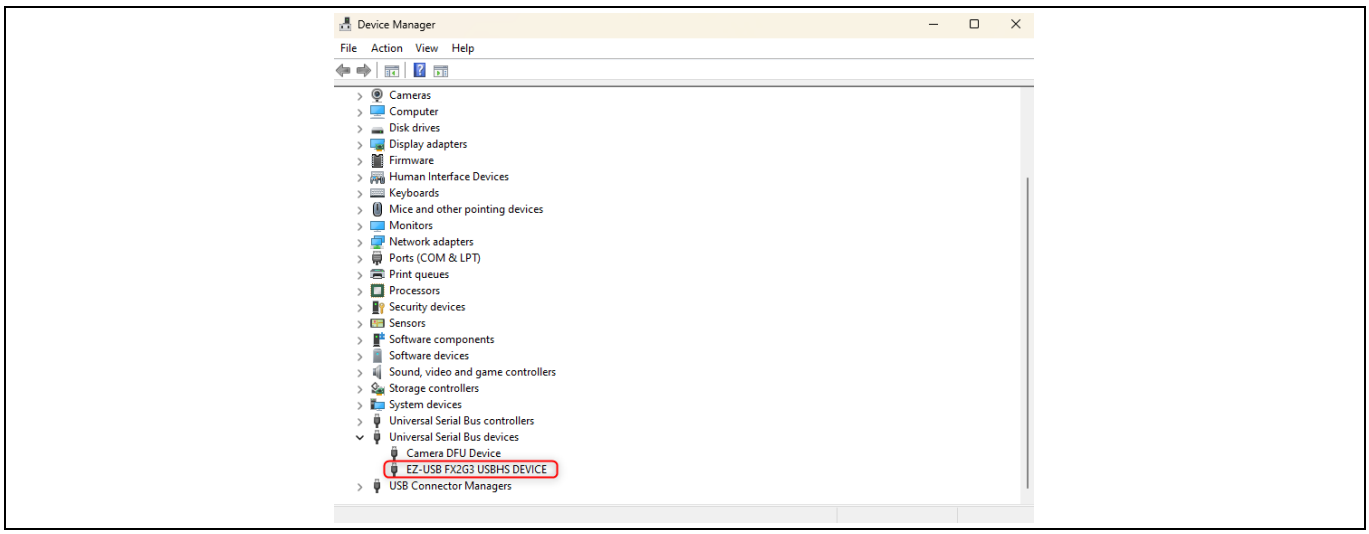


Figure 9 Board enumerated as EZ-USB™ FX2G3 in Windows Device Manager

3. Open the EZ-USB™ Control Center application, select the device (highlighted in red color), and then select **Data loopback**

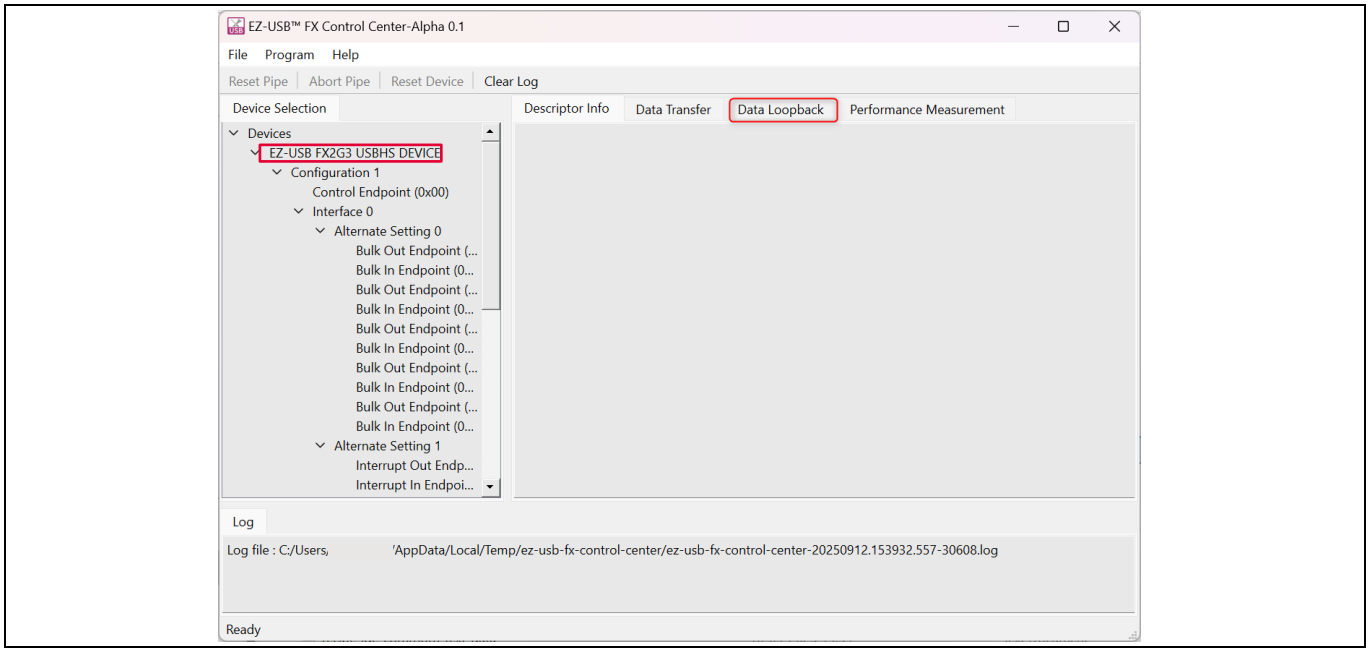


Figure 10 Control Center window

Run the application

4. After device selection, choose the endpoint pair. The endpoint pairs must be selected in pairs as mentioned below:
   - If Bulk In Endpoint is 0x81, then Bulk Out Endpoint is 0x01
   - If Bulk In Endpoint is 0x82, then Bulk Out Endpoint is 0x02
   - If Bulk In Endpoint is 0x83, then Bulk Out Endpoint is 0x03
   - If Bulk In Endpoint is 0x84, then Bulk Out Endpoint is 0x04
   - If Bulk In Endpoint is 0x85, then Bulk Out Endpoint is 0x05

Note: If any other pair is selected, the transactions will fail.

5. Set the data pattern to any one of the four options provided
   - If the **Constant Bytes** option is selected, enter a hex value in the **Constant/Start Value** field (maximum value: **0xFF**)
   - No value is required for the remaining data pattern options
   - After configuration, select **Start**
6. Provide a hex value in the **Constant/Start value** field if the “Constant Bytes” option is selected for the data pattern. The maximum value that can be given is 0XFF; no values need to be provided if any other option is selected and select **Start**

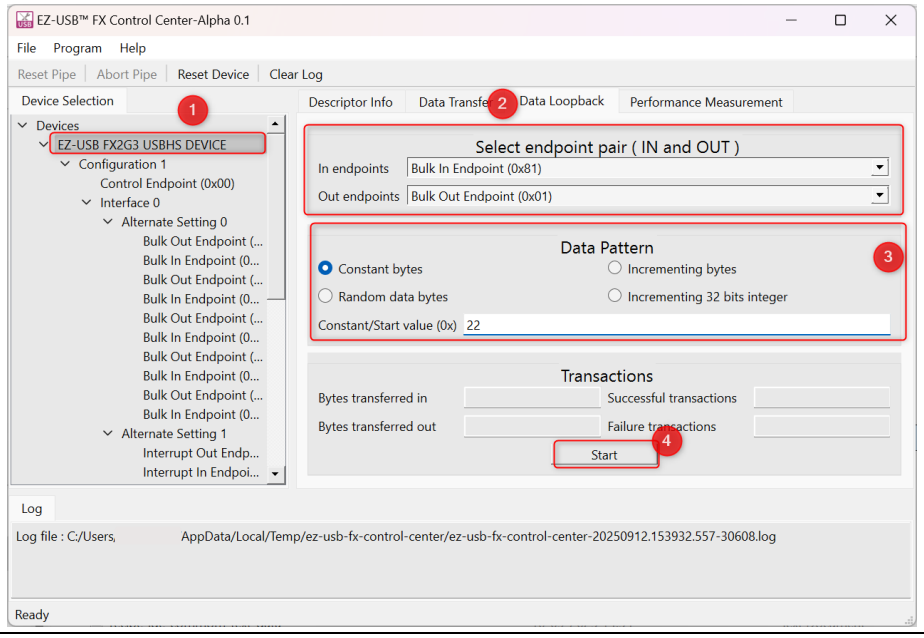


Figure 11 Control Center setup for Data Loopback

7. Observe the Data Loopback transactions in the Control Center under **Transactions**. Click **Stop** to stop the transfers

Run the application

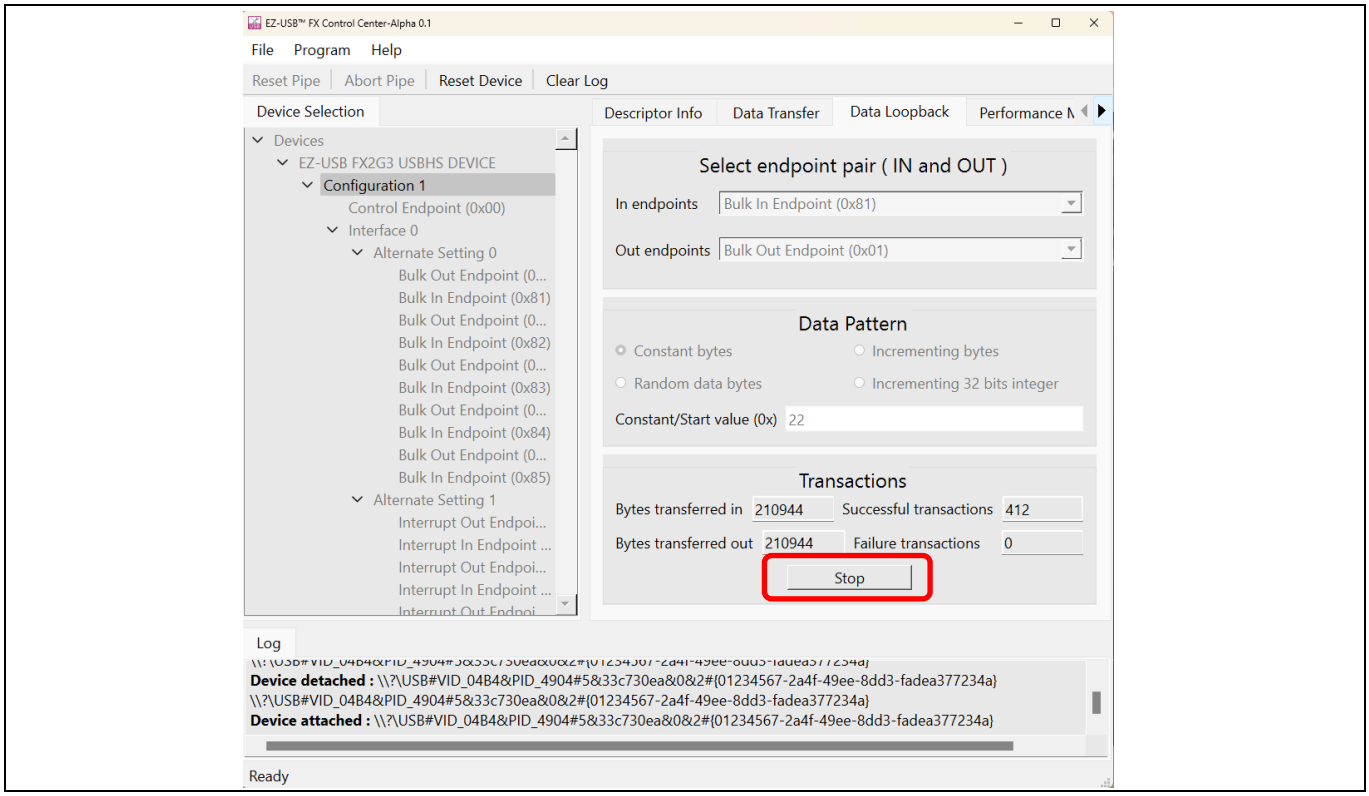


Figure 12 Data loopback transactions (Constant value 0x22)

For other code examples, refer to the read me.txt file available on the ModusToolbox™ project for respective code examples.

6 Troubleshooting

6.1 EZ-USB™ FX2G3 programming test

1. If the Control Center does not detect the EZ-USB™ FX2G3 device:
   a) Press and hold the PMODE switch (SW1)
   b) Reset the EZ-USB™ FX2G3 device by either pressing and releasing the RESET switch or by power-cycling the kit
   c) Release the PMODE switch after a delay

If the earlier step does not help and if you have any questions, create a support request on the Infineon Technical Support page.

References

[1] Infineon Technologies AG: *EZ-USB™ FX2G3 USB 2.0 peripheral controller webpage*; Available online

[2] Infineon Technologies AG: *EZ-USB™ FX2G USB 2.0 peripheral controller datasheet*; Available online

Glossary

CAN
Controller Area Network

DAP
debug access port

DDR3
double data rate 3 (type of SDRAM)

DMA
direct memory access

DVK
development kit

EC
electromagnetic compatibility directive

EMC
electromagnetic compatibility

ESD
electrostatic discharge

FPGA
field programmable gate array

FS
Full-Speed (USB mode)

GPIO
general-purpose input/output

HS
High-Speed (USB mode)

I2C
inter-integrated circuit (serial communication protocol)

JTAG
Joint Test Action Group (debug interface)

KB
kilobyte

LGA
land grid array (package type)

LVCMOS
low-voltage complementary metal-oxide semiconductor

MCU
microcontroller unit

Glossary

MIPI
mobile industry processor interface

PCB
printed circuit board

PDM
pulse density modulation (microphone interface)

PMODE
programming mode

PQFN
power quad flat no-lead (package type)

QSG
quick start guide

RMA
returned material analysis

SCB
Serial Communication Block

SDK
software development kit

SPI
Serial Peripheral Interface

SRAM
static random access memory

SWD
Serial Wire Debug

TVS
transient voltage suppression (diode)

UAC
USB Audio Class

UVC
USB Video Class

Revision history

Document revision	Date	Description of changes
**	2026-01-30	Initial release
*A	2026-03-12	• Added endpoint pair selection options • Modified description of FX2G3(U1)

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Safety & Operating Instructions:
Customer shall check the Evaluation Board for any physical damage which may have occurred during transport. If customer detects any damages or defects in the Evaluation Board, customer shall not connect the Evaluation Board to a power source. Customer shall contact Infineon for further support. If customer observes unusual operating behavior during the evaluation process, customer shall immediately shut off the power supply to the Evaluation Board and consult Infineon for support.
Customer shall not touch the Evaluation Board during operation and keep a safe distance.
Customer shall not touch the Evaluation Board after disconnecting the power supply, several components may still store electrical voltage and can discharge through physical contact. Several parts, like heat sinks and transformers, may still be very hot. Allow the components to cool before touching or servicing.
The electrical installation must be completed in accordance with the appropriate safety requirements.