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CYUSB3KIT-003

SuperSpeed Explorer Kit User Guide

Doc. # 001-93186 Rev. *A

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

Phone (USA): 800.858.1810
Phone (Intnl): +1.408.943.2600
http://www.cypress.com

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Contents

Safety Information

Regulatory Compliance

The CYUSB3KIT-003 SuperSpeed Explorer kit is intended for use as a development platform for hardware or software in a laboratory environment. The board is an open-system design, which does not include a shielded enclosure. This kit may cause interference to other electrical or electronic devices in close proximity. In a domestic environment, this product may cause radio interference. In such cases, take adequate preventive measures. Also, do not use this board near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures must be taken.

The CYUSB3KIT-003 SuperSpeed Explorer contains electrostatic discharge (ESD) sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Cypress recommends proper ESD precautions to avoid performance degradation or loss of functionality. Store unused CYUSB3KIT-003 SuperSpeed Explorer boards in the protective shipping package.

End-of-Life/Product Recycling

This kit has an end-of-life cycle five years from the year of manufacturing mentioned on the back of the box. Contact your nearest recycler to discard the kit.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. Cypress recommends that you perform procedures only at an ESD workstation. If an ESD workstation is not available, use appropriate ESD protection by wearing an antistatic wrist strap attached to the chassis ground (any unpainted metal surface) on the board when handling parts.

Handling Boards

CYUSB3KIT-003 boards are sensitive to ESD. Hold the board only by its edges. After removing the board from its box, place it on a grounded, static-free surface. Use a conductive foam pad if available. Do not slide the board over any surface.

1. Introduction

Cypress EZ-USB® FX3™ (FX3) is an ARM-based controller designed to implement USB 3.0 peripherals. USB 3.0 offers the SuperSpeed signaling rate of 5 gigabits per second, which is 10 times greater than the high-speed signaling rate of 480 megabits per second. Because FX3 is USB 3.0 compliant, in addition to operating at the new SuperSpeed data rate, it can also operate at the High-Speed and Full-Speed USB data rates.

FX3 has a fully configurable General Programmable Interface (GPIF™ II) that can interface with any processor, ASIC, image sensor, or field-programmable gate array (FPGA). It provides easy and glueless connectivity to popular industry interfaces such as synchronous slave FIFO, asynchronous SRAM, asynchronous and synchronous address data multiplexed interfaces, image sensor interfaces, and CompactFlash. Additionally, users can define proprietary interfaces using Cypress's GPIF II Designer tool, which is packaged with the FX3 Software Development Kit (SDK).

The SuperSpeed Explorer Kit combines hardware, software, and documentation that enable customers to evaluate the FX3 device. This user guide describes the steps to install the software required by the SuperSpeed Explorer Kit and to operate the development board provided with the kit. The guide also documents different types of firmware download and debug methods with detailed instructions. Two example projects (USBBulkSourceSinkLED and SRAM_FX3) explain the use of various features provided on the SuperSpeed Explorer Kit development board and the host applications provided with the FX3 SDK. This document also explains the hardware interfaces available on the development board.

Interconnect boards are available to interface the SuperSpeed Explorer Kit development board with Aptina image sensor boards, Xilinx FPGA boards, and Altera FPGA boards. See Section 4.4.1 on page 49 for more information on the interconnect boards.

1.1 Kit Contents

The SuperSpeed Explorer Kit contains the following:

- FX3 development board
- USB 3.0 A to B cable
- Quick start guide
- Jumpers

Visit the kit web page (www.cypress.com/go/SuperSpeedExplorerKit) for more information. Inspect the contents of the kit. If any parts are missing, contact your nearest Cypress sales office for further assistance.

1.1.1 Software

FX3 Software Development Kit (FX3 SDK):
The FX3 software development platform is based on the Eclipse integrated development environment (IDE). A prerequisite for using the SuperSpeed Explorer Kit is to download and install the FX3 Software Development Kit (www.cypress.com/go/FX3SDK). This package installs the EZ USB Suite

and ARM GCC toolchain, a firmware library with example projects, and the Cypress USB Suite, including a Windows driver and sample Microsoft Visual Studio applications. After installation, the Cypress Update Manager ensures that all modules are up to date.

SuperSpeed Explorer Kit Installer:
The SuperSpeed Explorer Kit (www.cypress.com/go/SuperSpeedExplorerKit) installer package installs documentation (such as user guide, quick start guide, and release notes), hardware files (such as schematic, PCB layout, and gerber), and firmware examples (USBBulkSourceSinkLED and SRAM_FX3). The SuperSpeed Explorer Kit installer also includes Windows drivers for FX3 and software for JTAG debugging, including an OpenOCD executable and configuration file to use the *CY7C65215 - USB-Serial Dual Channel Bridge with CapSense® and BCD* (www.cypress.com/go/CY7C65215) on the SuperSpeed Explorer Kit development board as an integrated debugger for FX3.

1.1.2 Tools Not Included

- Microsoft Visual C++ or C# software required for editing and building the USB PC application source code. Free Visual Studio Express editions are available on the Microsoft website.
- USB 3.0 capable PC host: The SuperSpeed Explorer Kit firmware examples can operate at either USB 2.0 or USB 3.0 speeds. To achieve maximum performance with the FX3 hardware, use a PC with a USB 3.0 host controller.
- Java Runtime Environment (JRE).

1.1.3 Other Suggested Tools

The following USB protocol analyzers can be used to analyze the traffic between the PC host and the FX3 device:

- Hardware analyzers
  - Ellisys USB Explorer 280
  - Lecroy USB Voyager M3i
  - Beagle USB 5000 SuperSpeed Protocol Analyzer
- Software protocol analyzers
  - SourceQuest SourceUSB
  - SysNucleus USBTrace
  - USBlyzer

1.2 Additional Learning Resources

Visit the EZ-USB FX3 web page (www.cypress.com/fx3/) for additional learning resources in the form of a datasheet, a technical reference manual, application notes, knowledge base articles, and training videos.

1.3 Documentation Conventions

Table 1-1. Document Conventions for Guides

Convention	Usage
`Courier New`	Displays file locations, user entered text, and source code: `C:\ ...cd\icc\`
Italics	Displays file names and reference documentation. For example, *CYUSBS232UART.cyusb.*
[**Bracketed, Bold**]	Displays keyboard commands in procedures: [**Enter**] or [**Ctrl**] [**C**]
File > Open	Represents menu paths: File > Open > New Project
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** icon and then click **Open**.
Times New Roman	Displays an equation: 2 + 2 = 4
Text in gray boxes	Describes cautions or unique functionality of the product.

1.4 Acronyms

The following table lists the acronyms used in this kit guide.

Acronym	Meaning
AC	Alternating current
ADMUX	Address data multiplexing
API	Application programming interface
ASIC	Application-specific integrated circuit
COM	Communication port
CTS	UART clear to send
DC	Direct current
DSP	Digital signal processor
DVK	Development kit
EEPROM	Electrically erasable programmable read-only memory
EP	Endpoint
ESD	Electrostatic discharge
FMC	FPGA mezzanine card
FPGA	Field-programmable gate array
Gbps	Gigabits per second
GCC	GNU compiler collection
GDB	GNU debugger
GPIF	General Programmable Interface
GPIO	General-purpose input/output
HSMC	High-speed mezzanine card
I^2C	Inter-integrated circuit
I^2S	Inter-IC sound
IDE	Integrated development environment

Acronym	Meaning
JTAG	Joint Test Action Group
KB	Kilobyte
LED	Light-emitting diode
MB	Megabyte
Mbps	Megabits per second
OS	Operating system
OTG	On-the-go
PC	Personal computer
PCB	Printed circuit board
PHY	Physical layer
PID	Product ID
RTOS	Real-time operating system
RTS	UART ready to send
SCB	Serial communication block
SCL	I^2C serial clock line
SDA	I^2C serial data line
SDK	Software development kit
SPI	Serial peripheral interface
USB	Universal serial bus
USB-IF	Universal Serial Bus Implementers' Forum
VID	Vendor ID

1.5 Document History

Revision	PDF Creation Date	Origin of Change	Description of Change
**	07/10/2014	NIKL	Initial version of kit user guide.
*A	08/01/2014	NIKL	Updated links. Minor content edits throughout the document.

2. Software Installation

This chapter guides you through the installation of the FX3 SDK for the Windows and Linux environments and the SuperSpeed Explorer Kit setup for the Windows environment.

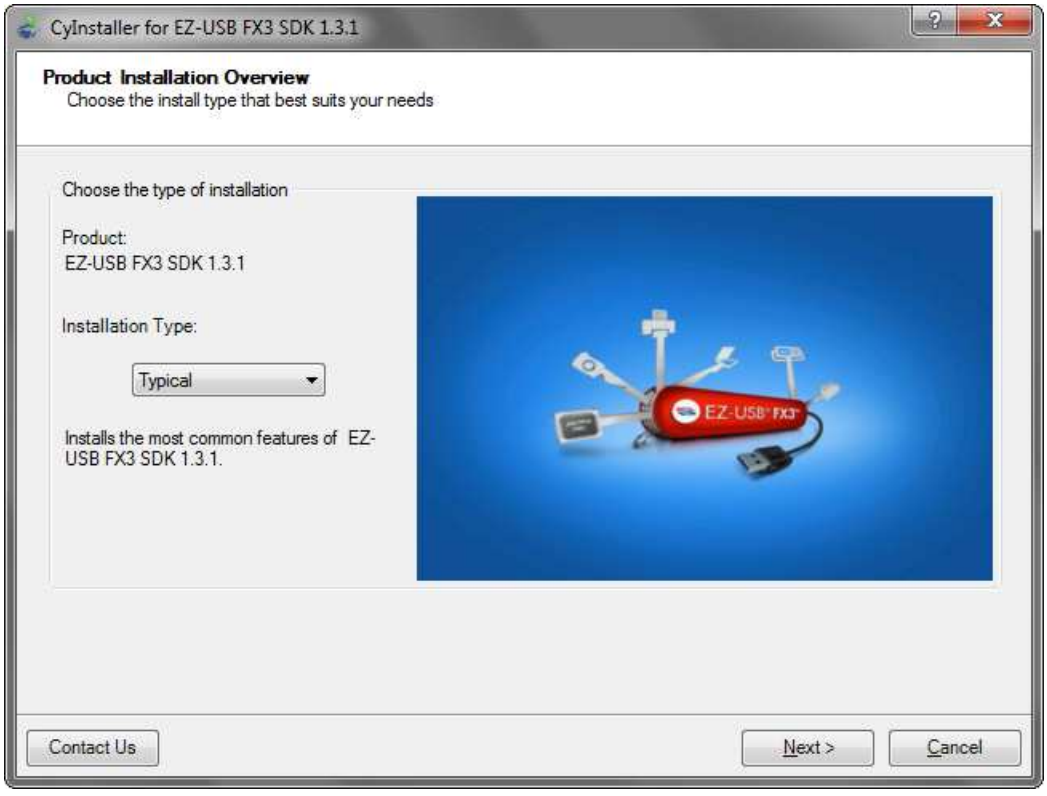
Note The SuperSpeed Explorer Kit Quick Start Guide, packaged with the kit box, specifies to download and install the SuperSpeed Explorer Kit Setup as the first step. If this step was followed, the FX3 SDK and SuperSpeed Explorer Kit Setup are already installed on your machine. You can jump to Section 2.5 on page 15 for steps to launch Cypress Update Manager. Cypress Update Manager helps ensure you have the latest FX3 SDK and the SuperSpeed Explorer Kit Setup installed on your machine.

2.1 FX3 SDK Installation on Windows OS

To install the latest version of the FX3 SDK, follow these steps:

1. Download the latest FX3 SDK from the EZ-USB FX3 Software Development Kit page (www.cypress.com/go/FX3SDK), which includes Windows and Linux downloads. If your browser does not ask to run the downloaded file, locate the *FX3SDKSetup.exe* file in the Downloads folder and double-click it to start the installer (Figure 2-1).

Figure 2-1. FX3 SDK Installer Screen



2. Click **Next** to start the Installation Wizard.
3. Accept the license agreements for the various software components and click **Next**. The installer indicates the completion progress (Figure 2-2).

Figure 2-2. Installation Progress Showing Individual Modules

2.2 Rolling Back to a Previous Version of FX3 SDK

Some features or application programming interfaces (APIs) of the SDK may not be supported in the latest version of the FX3 SDK. To use those features, you can roll back to any previous version of the FX3 SDK using the Cypress Update Manager. Follow the steps given in the knowledge base article, *How to Roll Back to a Previous Version of FX3 SDK - KBA89637* (www.cypress.com/go/KBA89637), to install any previous version.

2.3 FX3 SDK Installation on Linux OS

FX3 SDK version 1.2 and later revisions support firmware development with the EZ USB Suite on the Linux platform. The EZ-USB FX3 SDK (www.cypress.com/go/FX3SDK) for Linux is released in the form of a gzipped tar archive called "FX3_SDK.tar.gz". On extraction, this tar archive contains the following gzipped tar archives:

- FX3_Firmware.tar.gz: FX3 firmware library and examples
- ARM_GCC.tgz: Sourcery ARM GNU toolchain to compile firmware examples
- eclipse_x86.tgz: EZ USB Suite for 32-bit Linux OS
- eclipse_x64.tgz: EZ USB Suite for 64-bit Linux OS
- cyusb_linux_<Build_no>.tar.gz: The CyUSB Suite provides QT-based USB applications to communicate with the FX3 device

The installation procedure involves extracting these archives and setting environment variables. Refer to the *FX3_SDK_Linux_Support.pdf* file available in the following extracted folder of the FX3 SDK for Linux installation: `fx3_sdk_v1.3_linux\FX3_Firmware\cyfx3sdk\doc`.

2.4 SuperSpeed Explorer Kit Installation

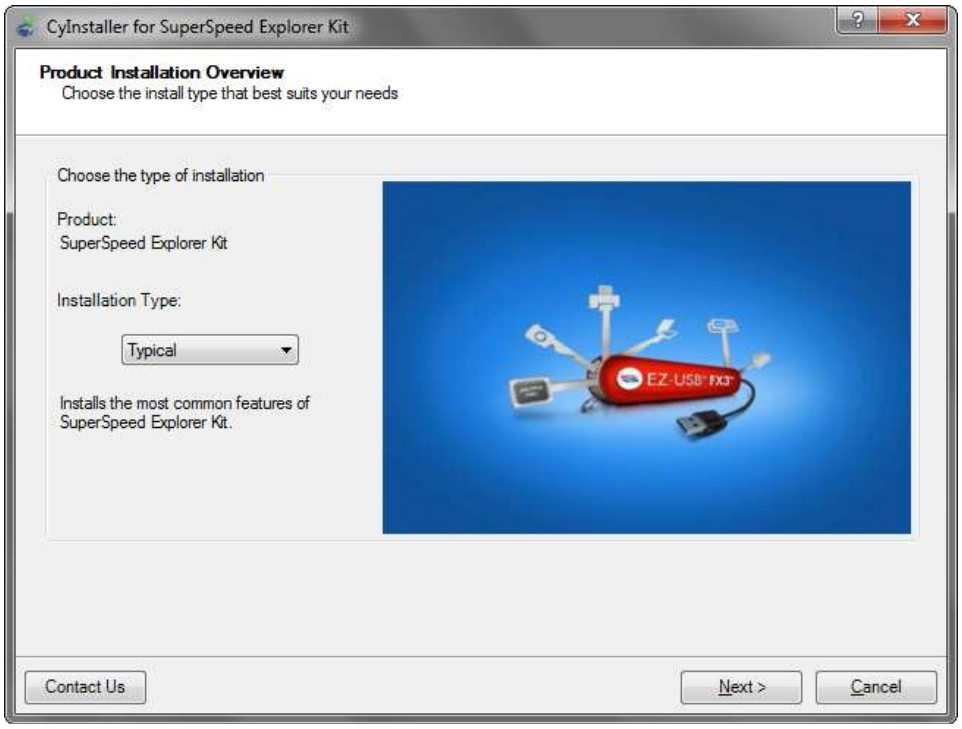
To install the SuperSpeed Explorer Kit software, follow these steps:

1. Download the latest kit installer from www.cypress.com/go/SuperSpeedExplorerKit. Locate the *SuperSpeedExplorerKitSetup.exe* file in the Downloads folder and double-click it to run the Installer (Figure 2-3).

Figure 2-3. SuperSpeed Explorer Kit Installer Screen

2. Click **Next** and select the required **Installation Type**. When installing for the first time, it is best to select the **Typical** installation type (Figure 2-4).

Figure 2-4. SuperSpeed Explorer Kit Setup Installation Type Selection



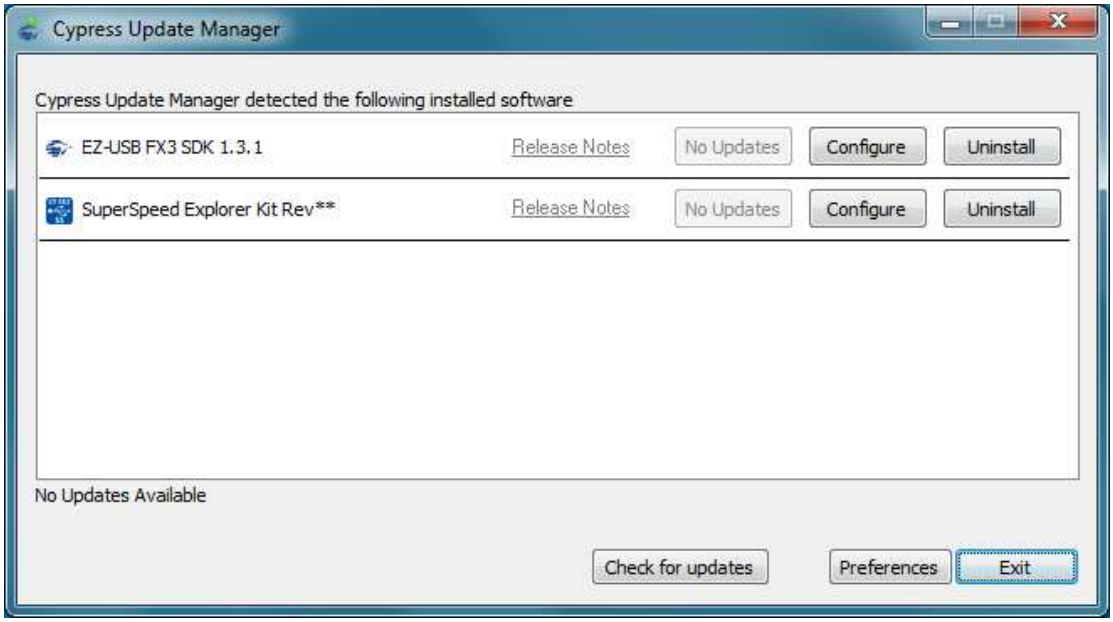
3. Click **Next** to start the Installation Wizard.
4. Accept the license agreements for the various software components and click **Next**. Wait until the installation is complete (Figure 2-5).

Figure 2-5. Installation Progress Showing Individual Modules

2.5 Cypress Update Manager

1. When the installation is complete, you have the option to run the Cypress Update Manager (Figure 2-6) to ensure you have the latest Explorer Kit revision installed. The Update Manager can be launched in Windows from the **Start** menu by choosing **All Programs > Cypress > Cypress Update Manager**. Click the **Check for updates** button at the bottom of the **Cypress Update Manager** window. If **No Updates** appear next to the FX3 SDK or SuperSpeed Explorer Kit, click the **Exit** button. If there are updates, click the **Update** button to download and install the latest software.

Figure 2-6. Cypress Update Manager



2. The installation creates the SuperSpeed Explorer Kit folder in the path `<Install Directory>\Cypress` (note that for Windows 7 and above, the default install directory is `C:\Program Files (x86)` and for Windows XP, the default install directory is `C:\Program Files`). This folder contains documentation, drivers, hardware files, example firmware, and an OpenOCD executable for using the USB-Serial IC (www.cypress.com/go/CY7C65215) as a USB-JTAG debugger.

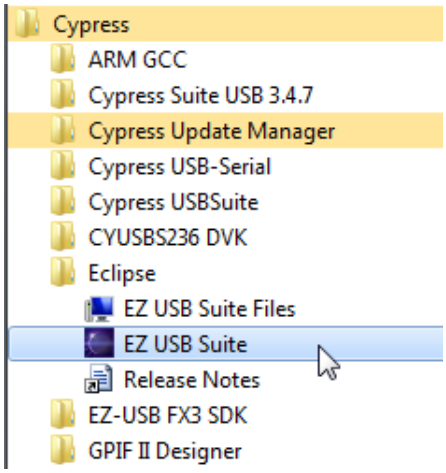
2.6 EZ USB Suite (Eclipse) IDE

2.6.1 Starting the EZ USB Suite

Note The EZ USB Suite is dependent on the Java Runtime Environment (JRE). As the JRE is not packaged with the FX3 SDK 1.3.1, you need to download and install it separately. You can get the current version of Java from the Java website (http://java.com/en/download/index.jsp) if it is not already installed on the system.

Navigate to the Windows **Start** menu and select **All Programs**; click the **Cypress** folder to expand it (Figure 2-7). Click the **Eclipse** entry to expand it and double-click the **EZ USB Suite** entry.

Figure 2-7. Launch the EZ USB Suite

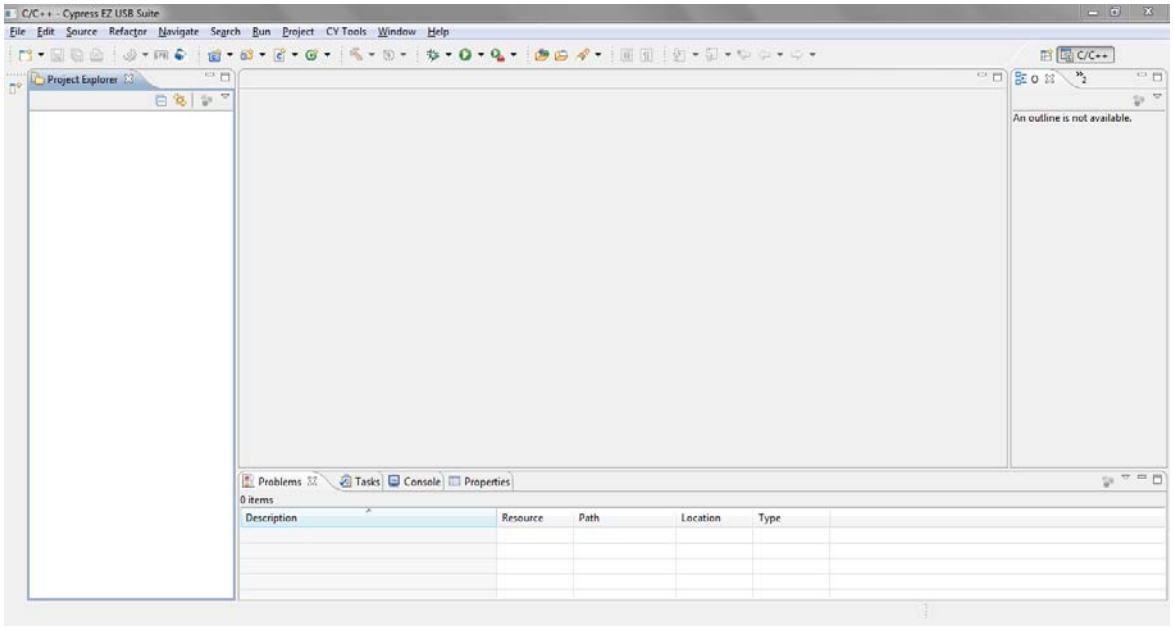


This launches a first-time startup screen that sets up a Workspace folder for all your Cypress Eclipse projects. Accept the default path of `C:\Users\(username)\Cypress\Workspace`. You may want to select **Use this as the default and do not ask again** to skip this message every time you start the EZ USB Suite.

You can create more workspaces by choosing **File > Switch Workspace > Other**. In this way, you can define different workspaces for different projects.

An empty **EZ USB Suite Workbench** appears as shown in Figure 2-8.

Figure 2-8. Empty EZ USB Suite Workbench

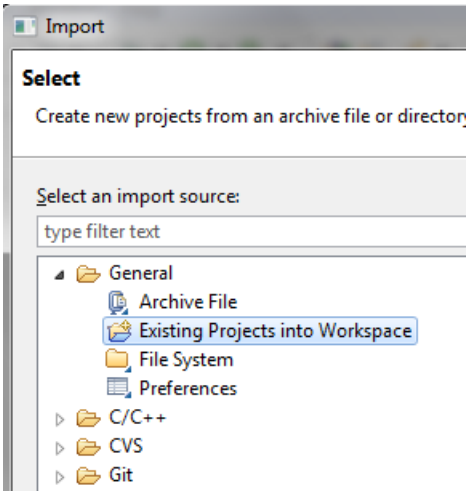


2.6.2 Importing a Project

To import an Eclipse project from any path, follow these steps.

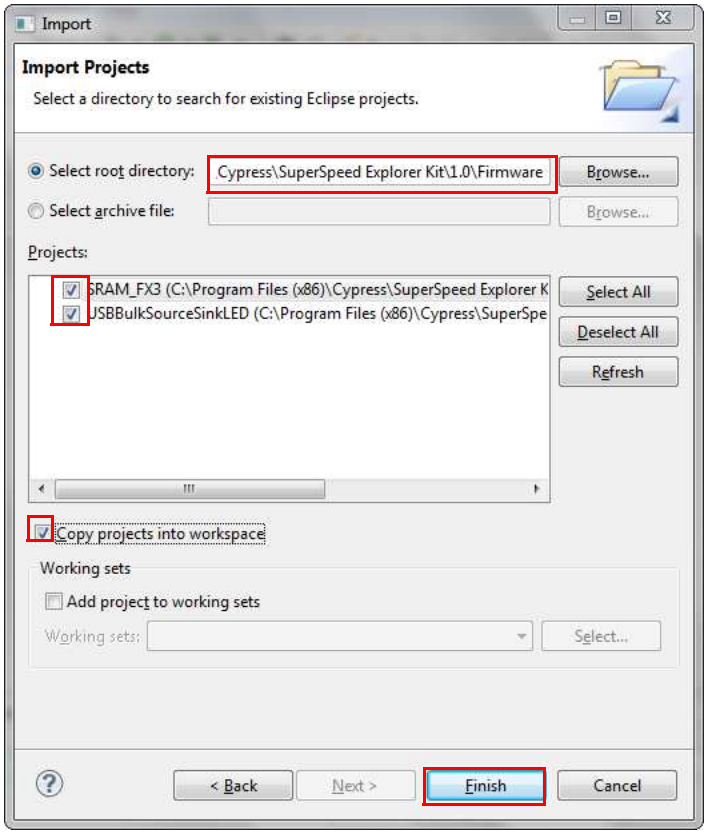
1. In the EZ USB Suite, choose **File > Import > General > Existing Projects into Workspace** (Figure 2-9). Click **Next**.

Figure 2-9. Import an Eclipse Project



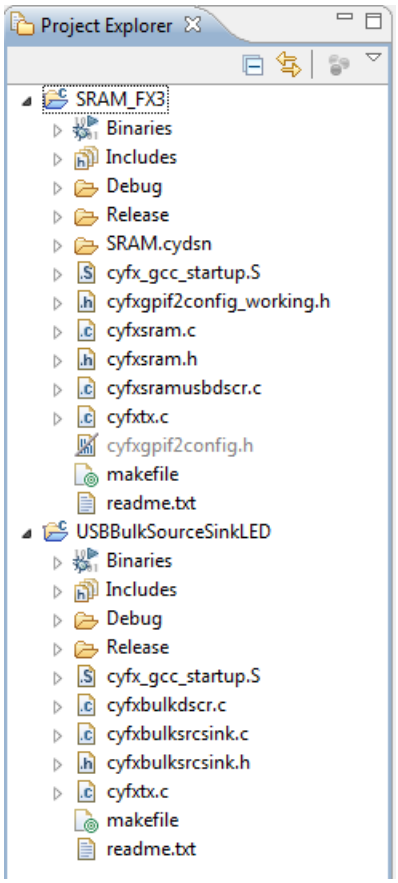
2. Click the **Browse…** button to **Select root directory**: and browse to the **Firmware** folder of the SuperSpeed Explorer Kit installation, as shown in Figure 2-10. The default path to the firmware folder is `<Install Directory>\Cypress\SuperSpeed Explorer Kit\1.0\Firmware` (for Windows 7 and above, the default install directory is `C:\Program Files (x86)` and for Windows XP, the default install directory is `C:\Program Files`). Select the **Copy projects into workspace** option so that the project folder will be copied to your Workspace folder. Select the firmware application in the **Projects:** box, and click **Finish**.

Figure 2-10. Browse to Project Folder



3. The added projects now appear in the **EZ USB Suite Project Explorer**. Double-click a project name to see the underlying components (Figure 2-11).

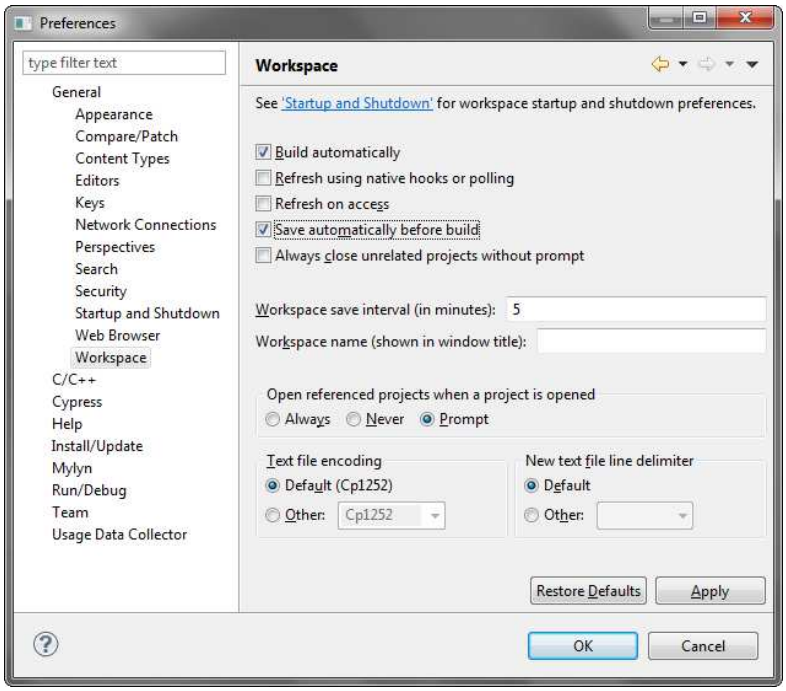
Figure 2-11. USBBulkSourceSinkLED and SRAM_FX3 Projects Added to Project Explorer



2.6.3 Automatically Saving Your Edits

It is recommended that you change one of the Eclipse default settings. To automatically save your edits before building the project, navigate to **Windows > Preferences > General > Workspace** and select **Save automatically before build** (Figure 2-12). Click **OK**.

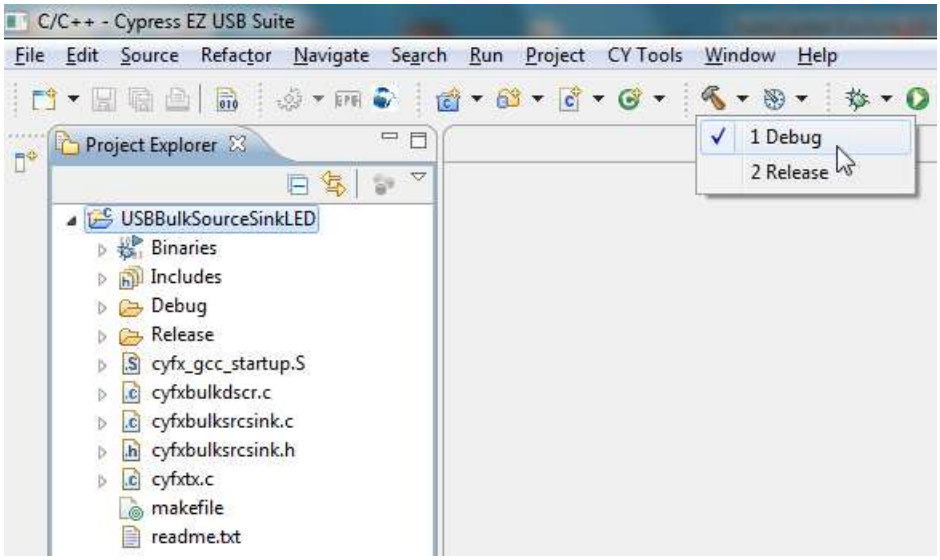
Figure 2-12. Automatically Saving Edits



2.6.4 Building the Project

To build an FX3 project, select the project in the Project Explorer window and click the Build icon (hammer) in the EZ USB Suite. You can choose to build a Debug version or a Release version of the firmware (Figure 2-13). The generated image file in the Release version is smaller than in the Debug version. See Section 3.5.2 on page 26 and Section 3.5.3 on page 28 to learn how to download the compiled code image into the SuperSpeed Explorer Kit development board.

Figure 2-13. Build Firmware Icon

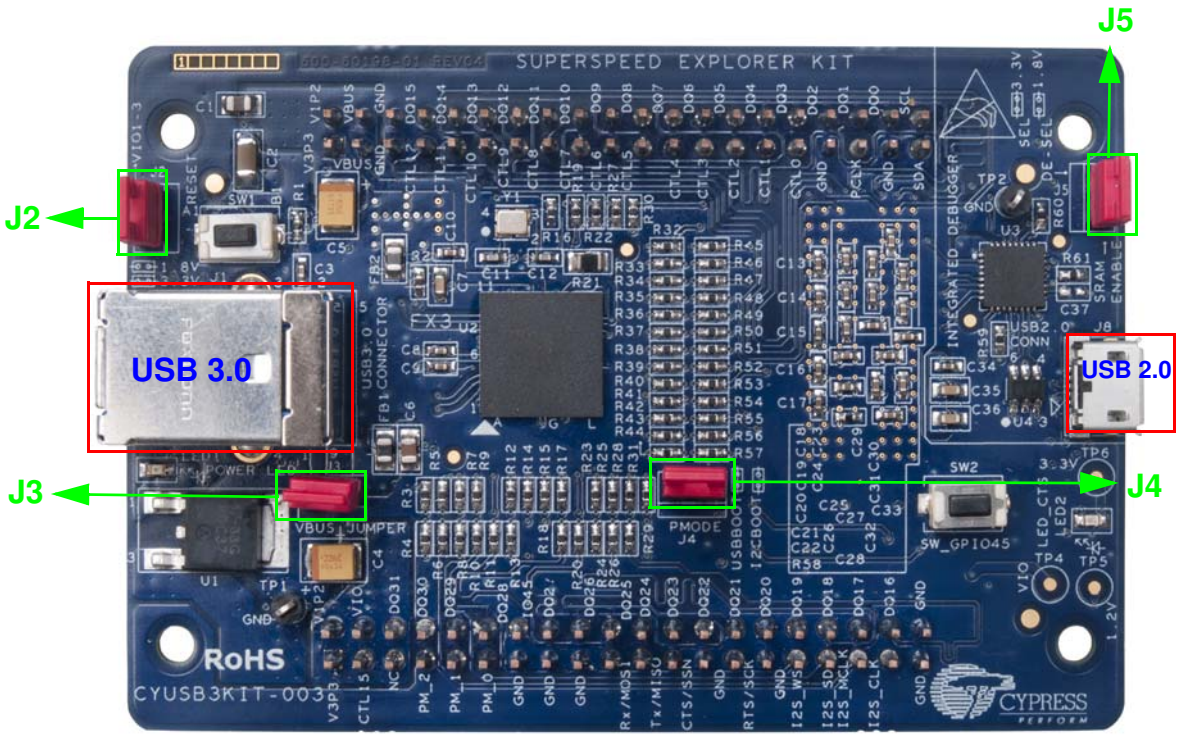


Note You can go to www.cypress.com/go/GettingStartedwithEzUsbSuite for a video course on getting started with the Eclipse IDE for FX3.

3. Kit Operation

The SuperSpeed Explorer Kit includes the development board shown in Figure 3-1.

Figure 3-1. SuperSpeed Explorer Kit Development Board



The development board provides convenient access to FX3 interfaces, such as GPIF II, I^2C, SPI, UART, and I^2S. The two 40-pin headers (on the reverse PCB side in Figure 3-1) provide FX3 signals to connect to external boards using the GPIF II interface. Note that for convenience, the headers have long pins that extend above the top side of the PCB for use as test points or attachment to mating connectors. All GPIF II signals, which include a 32-bit data bus, 13 control lines, and a 100-MHz clock, are available to connect to external devices such as FPGAs, CPLDs, image sensors, or microcontrollers. The FX3 SDK examples help you program and evaluate these interfaces. The GPIF II interface supports 32-, 24-, 16-, and 8-bit data/modes; unused GPIF II pins can alternatively serve as GPIO pins if the GPIF II interface is not required.

3.1 USB Connectors

The SuperSpeed Explorer Kit development board provides two USB connectors. The USB 3.0 Type B receptacle brings out the FX3 USB signals. This receptacle accepts either a USB 3.0 or USB 2.0 cable; the other end of the cable connects to a USB host PC. A USB 3.0 cable is included in the kit.

Use this port to test FX3 applications that communicate with a host PC at SuperSpeed or High-Speed rates.

The USB 2.0 Micro-B receptacle connects to an onboard Cypress CY7C65215 USB-Serial Dual Channel (UART/I2C/SPI) Bridge (www.cypress.com/go/CY7C65215), which is configured as an integrated debugger operating at the USB Full-Speed rate. This chip provides a bridge between the FX3 debug interface and a PC's USB port, enabling two debug methods: serial terminal messages and JTAG debug. These debug methods are explained in Section 3.7 on page 33.

3.2 Jumpers

The SuperSpeed Explorer Kit development board contains four jumpers, labeled J2–J5. The jumper settings are as follows.

Jumper J2: This jumper sets the voltage levels of the FX3 power domains VIO1, VIO2, and VIO3. Inserting the jumper selects 3.3 V while removing the jumper selects 1.8 V. These domains set the operating voltage of the FX3 interface pins. The default is to have the J2 jumper in place, selecting the 3.3-V interface. This makes the interface compatible with the 3.3-V SRAM connected to the GPIF II interface.

Jumper J3: This jumper is connected in series with the VBUS signal of the USB 3.0 connector. This jumper must be inserted to power the development board. The J3 jumper is provided to measure the development board's power consumption by removing the J3 jumper and connecting an ammeter between the J3 pin headers.

Jumper J4: This jumper selects the FX3 boot method. Similar to all Cypress EZ-USB parts, the code is loaded ("booted") into high-speed internal RAM for execution. The SuperSpeed Explorer Kit supports USB boot and I^2C boot. FX3 contains an internal ROM, where the boot code resides, and an internal RAM, where application firmware and data are stored. At power-on, depending on this jumper setting, FX3 boots from the internal ROM and then does one of the following:

- If J4 is removed, then FX3 copies the application firmware from the onboard 2-Mbit I^2C EEPROM to FX3's internal RAM and then enumerates with the functionality defined in the application firmware. If there is no valid firmware in EEPROM or if the EEPROM is disabled or not present, then FX3 enumerates as a bootloader device and enables firmware download to internal RAM through USB. This method of booting is referred to as I^2C boot, with fallback to USB. The USBBulkSourceSinkLED firmware is stored in the onboard EEPROM when the SuperSpeed Explorer Kit development board leaves the Cypress factory. The steps to store new firmware in EEPROM and then boot from it are explained in Section 3.5.3 on page 28.
- If J4 is inserted, then FX3 enumerates as a bootloader device and allows the application firmware to be loaded to internal RAM through USB. This boot method is referred to as USB boot. In this boot method, you can download the application firmware to FX3's RAM using a host application. The steps to load firmware to FX3's RAM using this boot method are explained in a later section.

The J4 jumper is labeled "PMODE" to correspond to the FX3 PMODE0 pin.

Jumper J5: This jumper is connected in series with the CTL0 pin of the FX3. The CTL0 pin is used as a chip select signal for the onboard SRAM external to FX3. J5 must be inserted for applications that use the SRAM. It is recommended that you deselect the SRAM by removing J5 when the SRAM is not used. Note that the SRAM operates at 3.3 V and does not support 1.8-V signaling. Therefore, the SRAM must be deselected if the 1.8-V interface is selected (if J2 is removed, then J5 should also be removed). Table 3-1 summarizes the default jumper settings.

Table 3-1. Default Jumper Settings

Jumper	Jumper State	Function

Table 3-1. Default Jumper Settings

J2	Short	Power domain VIO1, VIO2, and VOI3 voltages set to 3.3 V to support external 3.3-V interfaces and the onboard SRAM.
J3	Short	Development board is powered from USB 3.0 VBUS. This jumper must be in place for normal operation.
J4	Open	Boot from I^2C EEPROM on the development board, if a valid firmware image is present in EEPROM; otherwise, fall back to USB boot. **Note** By default, USBBulkSourceSink with LED Blink firmware is stored by EEPROM.
J5	Open	Deselect external SRAM.

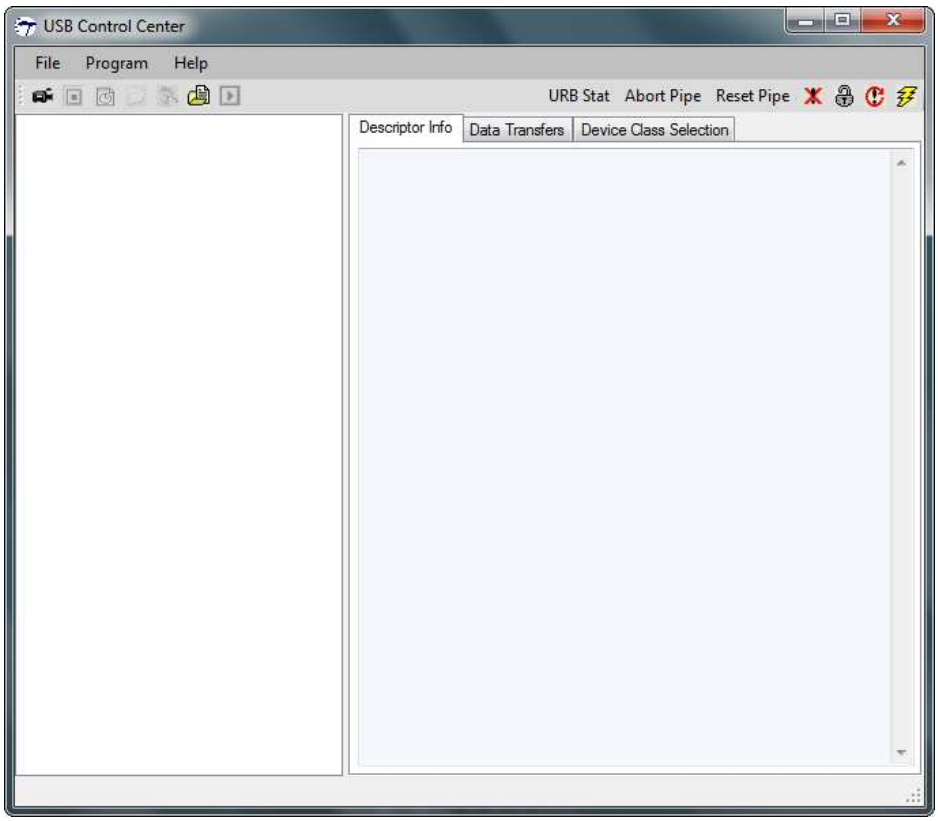
3.3 Power Mode

The development board operates only in USB bus-powered mode. Note that an FX3 design can also be self-powered but this feature is not supported in this kit.

3.4 USB Control Center

To explore various FX3 boot options, open Cypress's USB Control Center application by choosing **Start** menu **All Programs > Cypress > Cypress USBSuite > Control Center** (see Figure 3-2).

Figure 3-2. USB Control Center Opening Screen



Alternatively, the USB Control Center application can be launched by clicking the icon (shown in the following figure) in the EZ USB Suite application.

Note If you see various non-Cypress devices in the left panel of the USB Control Center application, select the **Device Class Selection** tab and deselect all check boxes except the one that says **Devices served by the CyUSB3.sys driver** (or a derivative).

The following sections demonstrate how to use the USB Control Center to identify connected USB devices, download FX3 code, and test firmware by conducting USB transfers.

3.5 Boot Options

As described in Section 3.2 on page 21, the SuperSpeed Explorer Kit development board supports the USB and I^2C boot options, When the J4 jumper is removed, FX3 boots from the onboard I^2C EEPROM if a valid firmware image is available in the EEPROM; otherwise, FX3 falls back to USB boot. When the J4 jumper is inserted, FX3 allows firmware download through USB.

This section discusses how to execute three FX3 boot options:

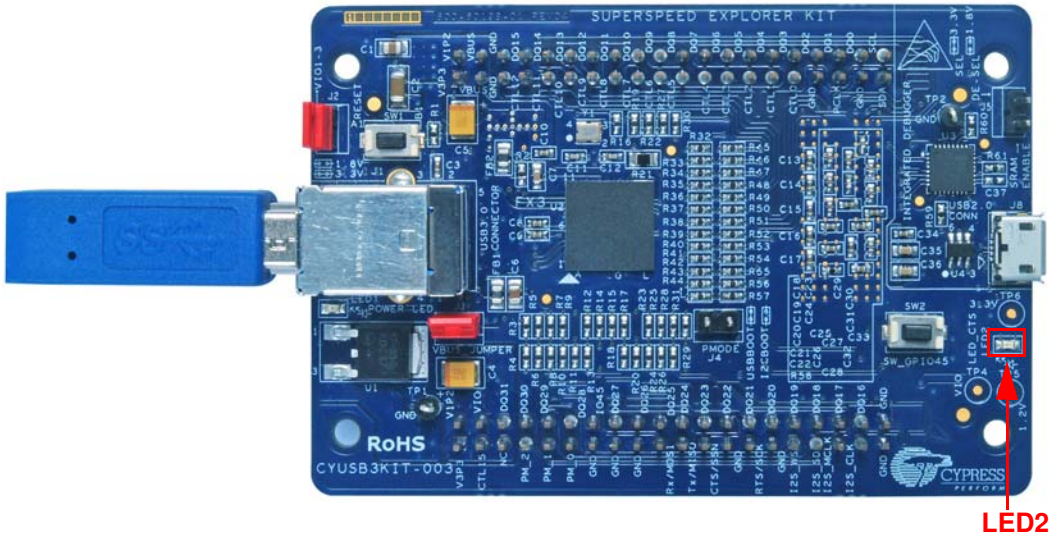
- Boot from the onboard I^2C EEPROM and run its code.
- Boot as a USB loader to load and run code from the PC.
- Program the onboard EEPROM with your own code and boot from it after a reset.

3.5.1 Boot From Onboard I^2C EEPROM

Confirm that the J4 jumper is not inserted. This enables FX3 to boot from the onboard I^2C EEPROM, which is loaded in the factory with the USBBulkSourceSinkLED example code.

1. Connect the development board to your computer using the USB 3.0 cable provided with the kit, as shown in Figure 3-3.

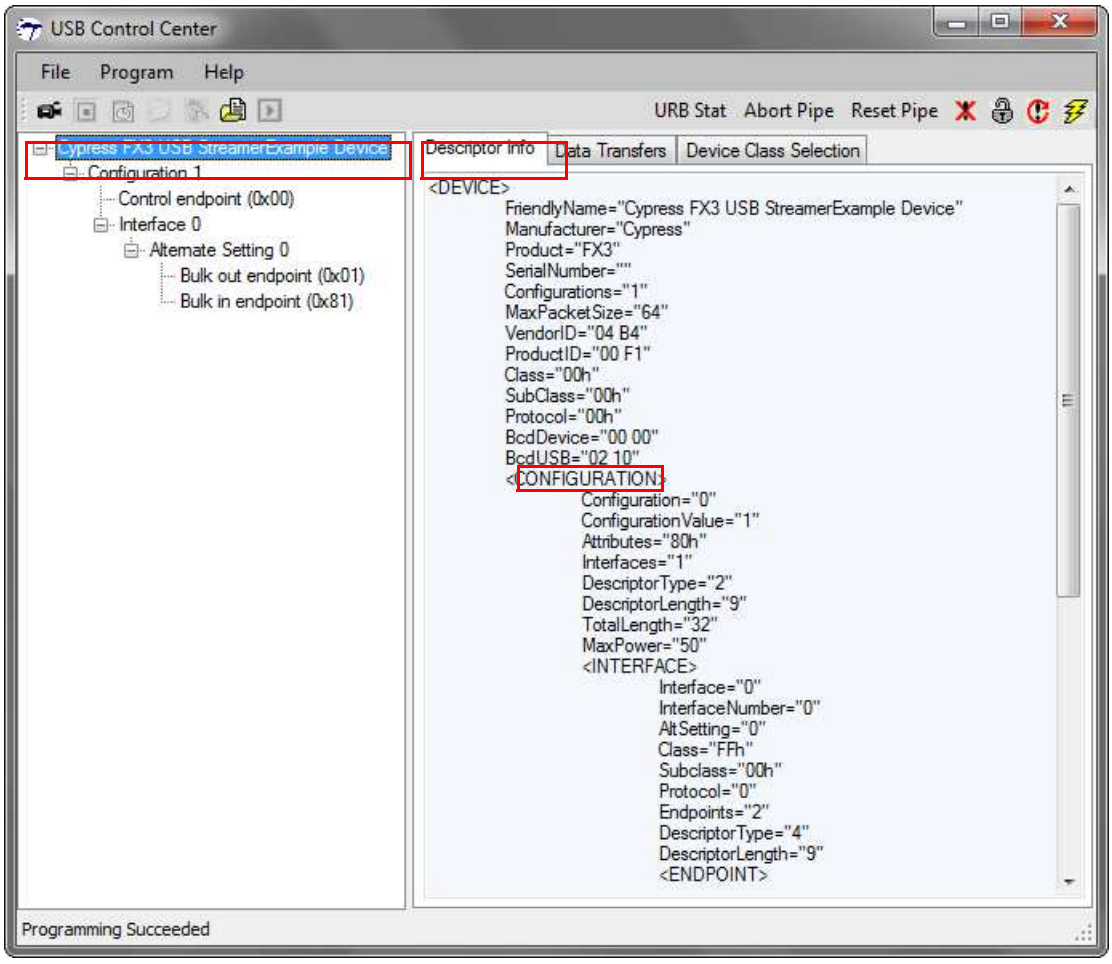
Figure 3-3. USB Connection



2. After connecting the development board to the host, wait for the Windows drivers to install. If the drivers do not install automatically, follow the steps in the “Appendix” on page 52 to manually install the drivers.
3. After the driver installation is complete, observe the blue LED (LED2). If the development board is connected to a USB 3.0 port, the blue LED (LED2) blinks. If the development board is connected to a USB 2.0 port, the blue LED (LED2) stays ON. If the development board is connected to a USB 1.1 port, the blue LED (LED2) stays OFF.

   Note This is a useful way to speed-test USB ports on a PC, where the USB operating speed is not always obvious. For example, some desktop PCs have the telltale blue plastic inserts (which are supposed to indicate USB 3.0) in both front and rear USB receptacles. Nevertheless, the front-panel receptacles often operate only at a USB 2.0 rate (480 Mbps).
4. Take a look at the **USB Control Center**. It should appear as shown in Figure 3-4. The **USB Control Center** detects the development board, which is named Cypress FX3 USB StreamerExample Device. This appears as the heading in a device tree in the left panel.

Figure 3-4. FX3 Board Connected to a USB 2.0 Port



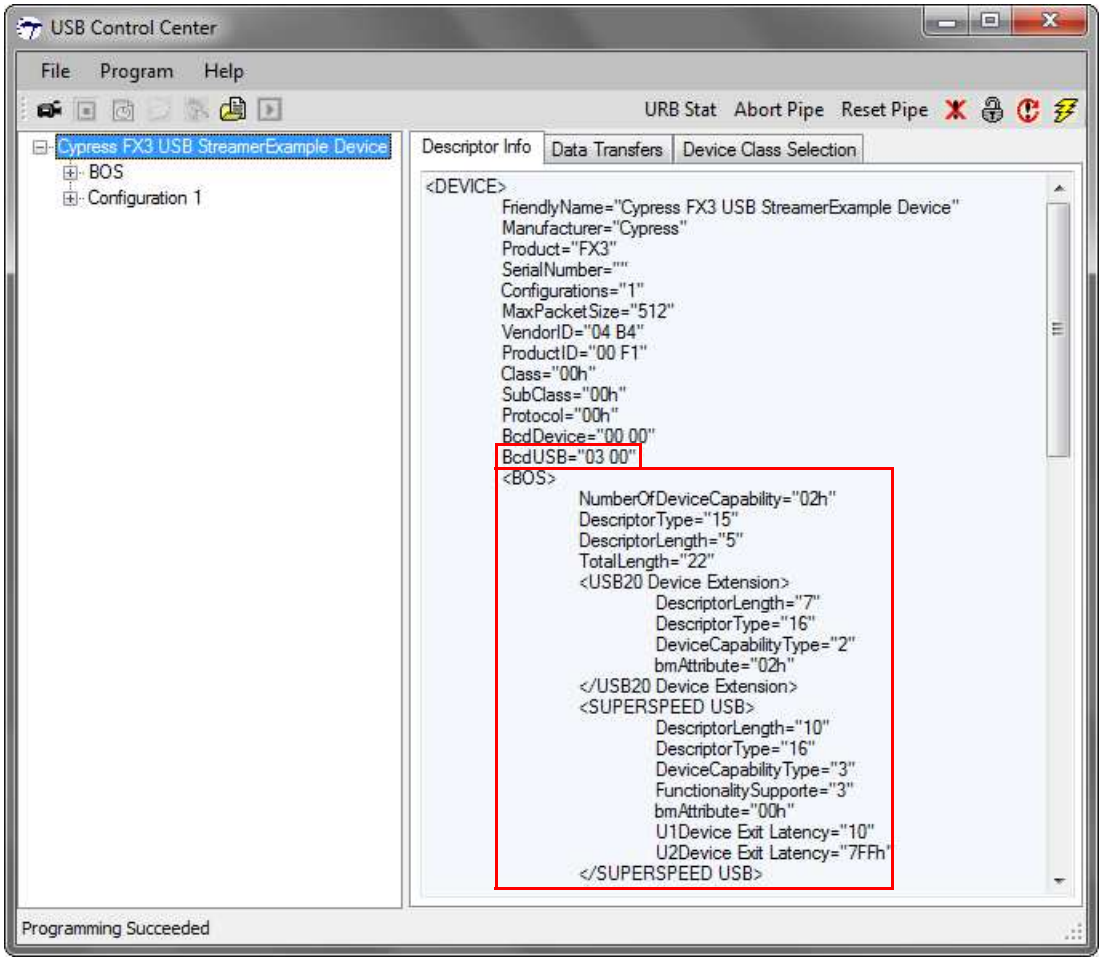
With the **Descriptor Info** tab selected, expand the device tree nodes and click on the various components – Device, Configuration, Interface, and so on. Notice that the descriptor information changes according to what is highlighted in the device tree. This illustrates the context-sensitive nature of the USB Control Center – you should select an item in the device tree before conducting a particular USB operation.

In Figure 3-4, the development board is connected to a USB 2.0 receptacle. One way to determine this is to look at the **BcdUSB** entry "02 10", which indicates the USB specification version under which the device enumerated (USB 2.1). With this connection, the blue LED (LED2) on the board stays ON to indicate the USB 2.0 High-Speed connection.

Compare Figure 3-4 with Figure 3-5, where the same development board was unplugged from the front-panel USB 2.0 receptacle and plugged into a rear-panel USB 3.0 receptacle on the same PC. The blue LED now blinks and the **BcdUSB Descriptor Info** entry now reads "03 00", indicating a USB 3.0 device. SuperSpeed devices also uniquely contain **Binary Device Object Store (BOS)** descriptors, as shown in Figure 3-5.

The same development board is now operating with SuperSpeed capability. This demonstrates an important USB 3.0/FX3 feature: Firmware can be written to automatically detect and support SuperSpeed or legacy USB attachments. The example Cypress code shows how this can be done.

Figure 3-5. Same Device, Different Port, Now Operating as a USB 3.0 Device



Another USB Control Center option is to conduct USB transfers to and from the FX3 board. The example firmware booted from the EEPROM contains code to respond to a custom USB request type called a 'vendor request'. To exercise this option, select the **Control endpoint (0x00)** item in the device tree and click the **Data Transfers** tab, as shown in Figure 3-6. Then select 'Vendor' from the **Req type** (USB request type) drop-down list. The example firmware responds to a vendor request code of 0xAA, which you enter in the **Req code** box. Your panel values should look similar to those in Figure 3-6. Enter a number between 0 and 9 in the **Data to send (Hex)** box and click the