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# CY6611 EZ-USB HX3PD Evaluation Kit Guide

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# Safety Information



The CY6611 EZ-USB® HX3PD Evaluation Kit (EVK) 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. Due to this reason, the board 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 CY6611 EZ-USB HX3PD EVK contains 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. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused CY6611 EZ-USB HX3PD EVK boards in the protective shipping package.
--	---

	<b>End-of-Life/Product Recycling</b> This kit has an end-of-life cycle of five years from the year of manufacturing mentioned on the back of the box. Contact your nearest recycler for discarding 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

CY6611 EZ-USB HX3PD EVK 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.

Any physical action on the CY6611 EZ-USB HX3PD EVK such as changing wires, jumper settings, or measuring voltages can cause stress on the CY6611 printed circuit board assembly (PCBA) and Type-C connectors. Ensure that the PCBA has proper support on the bottom side to avoid stress on the PCBA when the EVK is in operation.

## Do's and Don'ts



- Do not supply power through DC Power Jack (D12) and DC Terminal (J11) simultaneously. This may damage the CY6611 EVK board.
- If an external DC power source is used to power the CY6611 EVK board, ensure that the power supply is connected to the DC Terminal (J11) as per the marked polarity (+/-).
- Do not exceed 20 V DC input at the DC Terminal (J11) of the CY6611 EVK board.
- Do not make any hardware modifications to the CY6611 EVK board. Such modifications may make the CY6611 EVK unusable.
- Do not apply voltage on the test points more than what they are rated for.
- Do not apply reverse voltage on the power domain test points.

## Identifying Kit Revision and Serial Number

The CY6611 kit revision and serial number are printed on a sticker and pasted at the bottom side of the CY6611 kit box. See the figure below for more details.



# 1 Introduction



The CY6611 EZ-USB® HX3PD EVK is based on the Cypress' EZ-USB HX3PD Hub controller (CYUSB4347-BZXC). HX3PD is a family of USB 3.1 Gen 2 (10 Gbps) Type-C Hub controllers with USB Power Delivery (PD) that complies with the USB 3.1 Gen 2 specification, and the latest Type-C and PD standards. CYUSB4347-BZXC is a USB-IF certified USB 3.1 Gen 2 (10 Gbps) hub silicon (TID # 5030000008). The CY6611 EVK is a 7-port evaluation kit designed to demonstrate the USB 3.1 Gen 2 hub, PD 3.0 and Battery Charging (BC 1.2) functionalities of the HX3PD controller.

## 1.1 Kit Contents

The following are the contents of the CY6611 EZ-USB HX3PD EVK:

- CY6611 EZ-USB HX3PD EVK Board (One number)
- 19-V, 65.2-W AC/DC Power Adapter (One number)
- USB Full-Featured Type-C Cable (One number)
- Quick Start Guide

Figure 1-1. CY6611 Kit Contents



## 1.2 List of Recommended Hardware

See [Table 1-1](#) for the list of recommended hardware for CY6611 EVK to demonstrate the various kit operations described in the [Kit Operation](#) chapter. The recommended hardware can be replaced by equivalent hardware based on availability.

Table 1-1. List of Recommended Hardware

No.	Description	Manufacturer	MPN
1	Laptop with USB 3.1 Gen 2 (10 Gbps) and USB PD support	Lenovo	T470
2	USB 3.1 Gen 2 (10 Gbps) Solid State Drive (SSD) or Hard Disk Drive (HDD)	Samsung	T5
3	Smart phone with USB PD support	Xiaomi	Mi 6
4	USB 3.1 Gen 1 (5 Gbps) SSD/ HDD/ Flash Drive	SanDisk	-
5	USB 2.0 Flash Drive	Generic	-
6	Smart phone with BC 1.2 specification support	-	-
7	Apple device with support for Apple Charging	Apple	-
8	Digital Multimeter	Generic	-
9	USB Type-C to Type-A cable (Optional. Required for programming HX3PD firmware from a PC/Laptop that does not have a Type-C port)	JAE Electronics	DX07519S10L19294



## 1.3 Getting Started

The user guide helps to familiarize you with the CY6611 HX3PD Evaluation Kit. The [Installation](#) chapter provides step-by-step instructions to install the software required for the kit. The [CY6611 System Design](#) chapter describes the hardware design and functional description of the kit. The features and the procedure to demonstrate the features of the kit are explained in the [Kit Operation](#) chapter. The [Programming the HX3PD Controller](#) chapter describes the general overview of the EZ-USB HX3PD Configuration Utility and the procedure for configuring and programming the HX3PD controller using the software utility.

## 1.4 Additional Learning Resources

Cypress provides a wealth of information at [www.cypress.com](http://www.cypress.com) to help you to select the right device for your design, and help you to understand the functionalities and capabilities of the HX3PD controller. The online resources provided in Cypress' official website also help you to quickly and effectively integrate the device into your design. The following is the list of online references for HX3PD and CY6611 EVK:

- **Overview:** [Cypress USB Controller Roadmap](#)
- **Product Webpage:** [EZ-USB® HX3PD: USB 3.1 Gen 2 Hub with Power Delivery](#)
- **Datasheet:** [HX3PD: USB 3.1 Gen 2 Hub with Power Delivery](#)
- **Application Note:** [AN222944 - HX3PD Hardware Design Guidelines and Checklist](#)
- **Kit Webpage:** [CY6611 EZ-USB HX3PD EVK](#)

### 1.4.1 Technical Support

If you have any questions, our technical support team is happy to assist you. You can create a support request on the [Cypress Technical Support](#) page.

You can also use the following support resources if you need quick assistance:

- [Self-help](#)
- [Local Sales Office Locations](#)

## 1.5 Document Conventions

Table 1-2. Document Conventions for Guides

Convention	Usage
<i>Italics</i>	Displays file locations, file names, and reference documentation: Read about the <i>sourcefile.hex</i> file in the <i>PSoC Creator User Guide</i> .
[Bracketed, Bold]	Displays keyboard commands in procedures: [Enter] or [Ctrl] [C]
File > Open	Represents menu paths: File > Open > New Project
<b>Bold</b>	Displays commands, menu paths, and icon names in procedures: Click the <b>File</b> icon and then click <b>Open</b> .

## 1.6 Abbreviations

Acronym/Abbreviation	Expanded Form
BC	Battery Charging
CDP	Charging Downstream Port
DCP	Dedicated Charging Port
DFP	Downstream Facing Port
DMC	Dock Management Controller
DRP	Dual-Role Port
DS	Downstream
EC	Embedded Controller
ESD	Electrostatic Discharge
EVK	Evaluation Kit
FS	Full Speed
GPIO	General-Purpose Input/Output
GUI	Graphic User Interface
HS	High Speed
I <sup>2</sup> C	Inter-Integrated Circuit
I/O	Input/Output
LED	Light Emitting Diode
LS	Low Speed
PC	Personal Computer
PD	Power Delivery
PDO	Power Data Object
PID	Product ID
SCL	Serial Clock
SDA	Serial Data
SDP	Standard Downstream Port
SPI	Serial Peripheral Interface
SS	SuperSpeed
UFP	Upstream Facing Port
US	Upstream
USB	Universal Serial Bus
VID	Vendor ID

# 2 Installation



This chapter describes the installation procedure for the CY6611 EZ-USB HX3PD EVK. The installation includes software, documentation, firmware, and hardware design files.

Following are the software utilities which are needed to operate the CY6611 EVK.

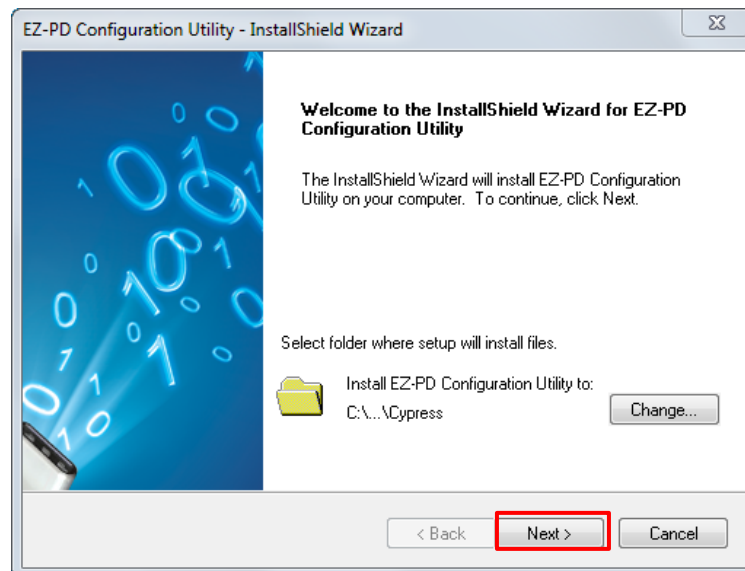
1. **EZ-USB HX3PD Configuration Utility:** This utility is required to configure the HX3PD firmware (DMC and PD Controller firmware) and to download the firmware to the CY6611 EVK.
2. **EZ-PD Configuration Utility:** This utility is launched by the EZ-USB HX3PD Configuration Utility to configure the DMC and PD Controller firmware.

The CY6611 EVK installation is a three-step process which is described in the following sections. Make sure that the installation is done only in the same order as specified.

## 2.1 Installing the EZ-PD Configuration Utility

1. Download the latest EZ-PD Configuration Utility setup file from the utility [webpage](#). The setup file contains the executable files for the utility and the documentation (User Manual and Release Notes). Double-click the executable to start the installation. Click **Next** when the screen shown in [Figure 2-1](#) appears and go through rest of the installation process.

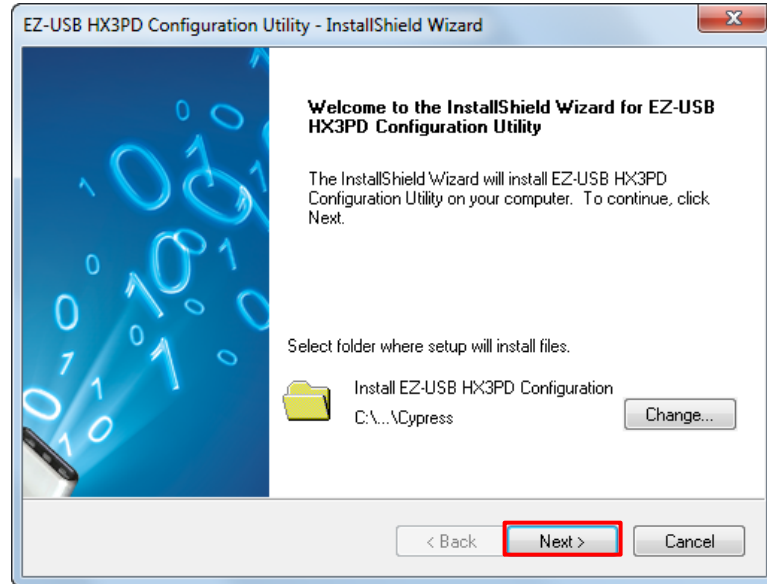
Figure 2-1. EZ-PD Configuration Utility Installer Screen



## 2.2 Installing the EZ-USB HX3PD Configuration Utility

1. Download the latest EZ-USB HX3PD Configuration Utility setup file from the utility [webpage](#). The setup file contains the executable files for the utility and the documentation (User Manual and Release Notes). Double-click the executable to start the installation. Click **Next** when the screen shown in [Figure 2-2](#) appears and go through rest of the installation process.

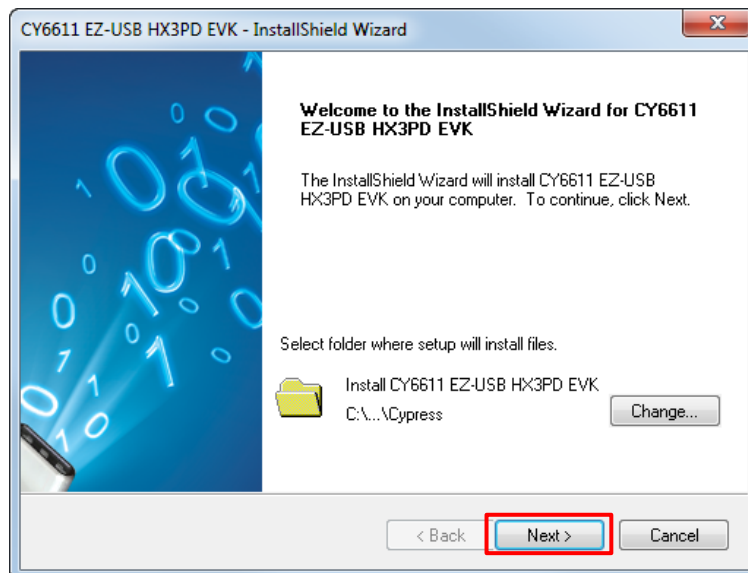
Figure 2-2. EZ-USB HX3PD Configuration Utility Installer Screen



## 2.3 CY6611 EZ-USB HX3PD EVK Software Installation

1. Download the latest kit setup file from the kit's [webpage](#). This package contains the kit hardware design files, firmware, and the kit documentation (Kit Guide, Quick Start Guide, and Release Notes). Double-click the executable to start the installation. Click **Next** when the screen shown in [Figure 2-3](#) appears and proceed with the installation process.

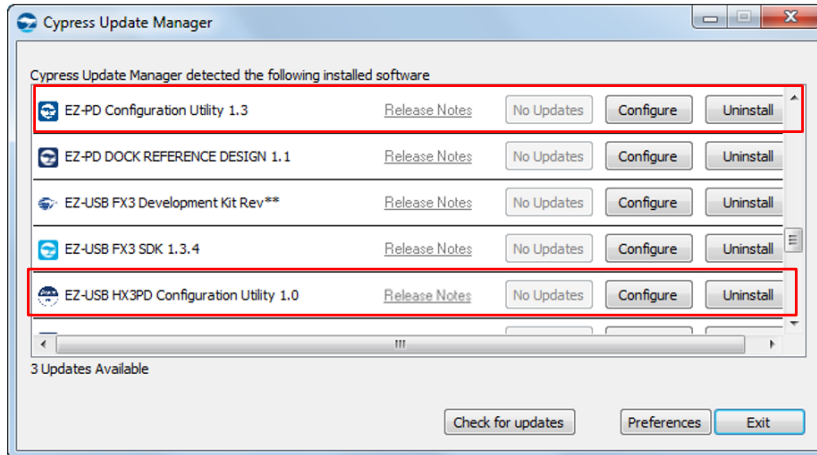
Figure 2-3. CY6611 EZ-USB HX3PD EVK Installer Screen



## 2.4 Cypress Update Manager Check

1. When the installation is complete, you have the option to launch the **Cypress Update Manager** (Figure 2-4) to make sure you have the latest packages. Click **Check for updates**. If **No Updates** appears adjacent to the CY6611 EZ-USB HX3PD EVK, EZ-USB HX3PD Configuration Utility and EZ-PD Configuration Utility entries, click **Exit**. If there are updates, click **Update** to download and install the corresponding package.

Figure 2-4. Sample Cypress Update Manager Screenshot



**Note 1:** The Cypress Update Manager screenshot shown in Figure 2-4 does not show the CY6611 EVK. Scroll through the list to locate CY6611 EVK.

**Note 2:** You can launch the Cypress Update Manager at any time from **Start > All Programs > Cypress > Cypress Update Manager**.

**Note 3:** After the installation is complete, the contents are available at this location: `<Install Directory>\CY6611 EZ-USB HX3PD EVK\1.0\`. On the Windows 32-bit platform, the default `<Install Directory>` is `C:\Program Files\Cypress`; on the Windows 64-bit platform, it is `C:\Program Files (x86)\Cypress`.

# 3 CY6611 System Design



This chapter describes the features supported by the CY6611 EVK and the hardware design details of the EVK.

## 3.1 CY6611 EVK Overview

CY6611 EVK enables evaluation of the following features of the EZ-USB HX3PD controller:

- USB Gen 2 (10 Gbps) data transfer on five Downstream (DS) ports (DS1-DS5).
- USB 2.0 data transfer on seven DS ports (DS1-DS7)
- USB PD 3.0 charging on Upstream (US) and DS1 port
- USB Battery Charging (BC v1.2) and Apple charging on four DS ports (DS2-DS5)
- Configure and program the HX3PD firmware

Table 3-1 lists the port wise capabilities and the connector types used on the CY6611 EVK hardware.

Table 3-1. CY6611 Port Capabilities

Port	Connector Type	USB Speed	Charging Protocols	Default Charging Configuration <sup>1</sup>
<b>Upstream (US)</b>				
US	Type-C	USB 3.1 Gen 2 (10 Gbps)	USB PD 3.0	2.3 A at 20 V (46 W)
<b>Downstream (DS)</b>				
DS1	Type-C	USB 3.1 Gen 2 (10 Gbps)	USB PD 3.0	1 A at 5 V (5 W)
DS2	Type-C	USB 3.1 Gen 2 (10 Gbps)	BC 1.2, Apple Charging	2.4 A at 5 V (12 W)
DS3	Type-C	USB 3.1 Gen 2 (10 Gbps)	BC 1.2, Apple Charging	2.4 A at 5 V (12 W)
DS4	Type-A	USB 3.1 Gen 2 (10 Gbps)	BC 1.2, Apple Charging	2.4 A at 5 V (12 W)
DS5	Type-A	USB 3.1 Gen 2 (10 Gbps)	BC 1.2, Apple Charging	2.4 A at 5 V (12 W)
DS6	Type-A	USB 2.0 (480 Mbps)	SDP Charging	500 mA at 5 V (2.5 W)
DS7	Type-A	USB 2.0 (480 Mbps)	SDP Charging	500 mA at 5 V (2.5 W)

<sup>1</sup> The maximum power consumed by all the ports should not exceed 55 W which is limited by the capacity of the power adapter provided with the kit. However, the HX3PD firmware can be configured to support USB PD charging at 20 V, 3 A on both the US and DS1 ports simultaneously. See the [Programming the HX3PD Controller](#) chapter to configure the HX3PD firmware for this requirement.

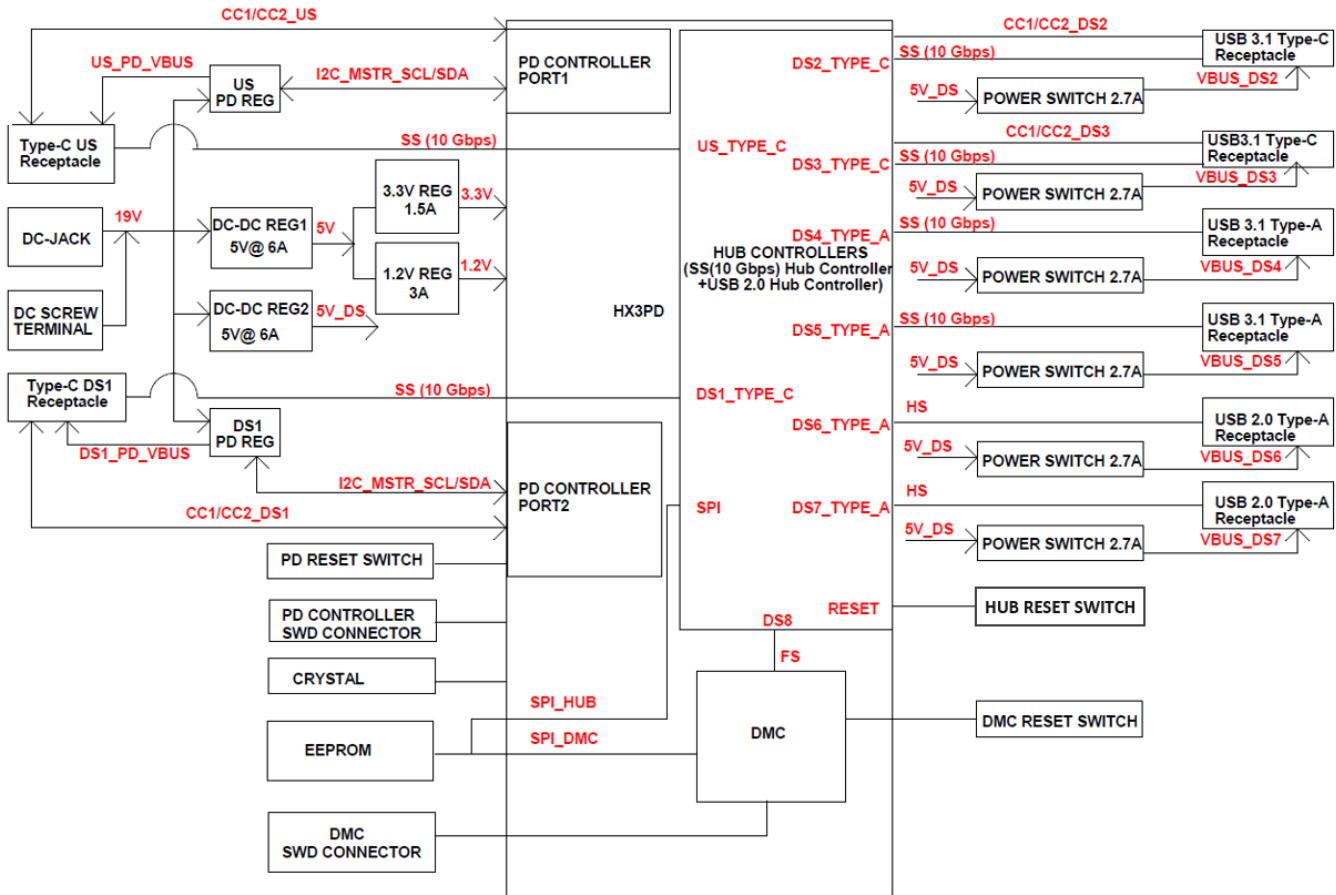
## 3.2 CY6611 Hardware Design

This section provides details of the CY6611 hardware architecture, power supply design, and the hardware interfaces.

### 3.2.1 CY6611 Hardware Design Overview

Figure 3-1 illustrates the CY6611 hardware design. CY6611 hardware is designed to evaluate the USB Gen 2 and USB PD capabilities of HX3PD controller on all applicable ports.

Figure 3-1. CY6611 EVK Hardware Block Diagram



The board is powered through one of the following two DC input interfaces: DC Power Jack (J12), DC Terminal (J11). The DC input is fed to the following four DC-DC regulators to power various parts of the system:

1. DC-DC Regulator (**DC-DC REG1**) provides a 5-V output which is fed to two additional DC/DC regulators (3.3 V and 1.2 V) whose outputs power HX3PD.
2. DC-DC Regulator (**DC-DC REG2**) provides a 5-V output which powers VBUS on DS2 to DS7 ports. The 5-V output from this regulator powers the switch associated with each of the DS ports (DS2-DS7). These power switches are controlled by HX3PD's Hub Controller to enable VBUS on the DS ports (DS2-DS7).
3. DC-DC Regulator (**US PD REG**) provides VBUS on the US port based on the USB PD contract negotiated between HX3PD and the PD capable laptop connected on the US port. Output from this regulator can be configured to support the complete USB PD voltage range (5 V to 20 V). The PD controller of HX3PD configures this regulator over I2C interface based on the PD contract negotiated with the laptop connected on the US port.
4. DC-DC Regulator (**DS1 PD REG**) provides VBUS on the DS1 port based on the USB PD contract negotiated between HX3PD and the PD capable device connected on the DS1 port. Output from this regulator can be configured to support the complete USB PD voltage range (5 V to 20 V). The PD controller of HX3PD configures this regulator over I2C interface based on the PD contract negotiated with the device connected on the DS1 port.

The hardware design files of CY6611 EVK (Schematics, BoM, and layout files) are available as part of the kit installation at <Install\_Directory>\CY6611 EZ-USB HX3PD EVK1.0\Hardware.

**Note:** On Windows 32-bit platforms, the default <Install Directory> is C:\Program Files\Cypress, and on Windows 64-bit platforms, it is C:\Program Files (x86)\Cypress.

### 3.2.2 CY6611 Jumpers, LEDs and Headers

This section provides details of various interfaces of the CY6611 EVK board.

Figure 3-2. CY6611 EVK Board Interfaces

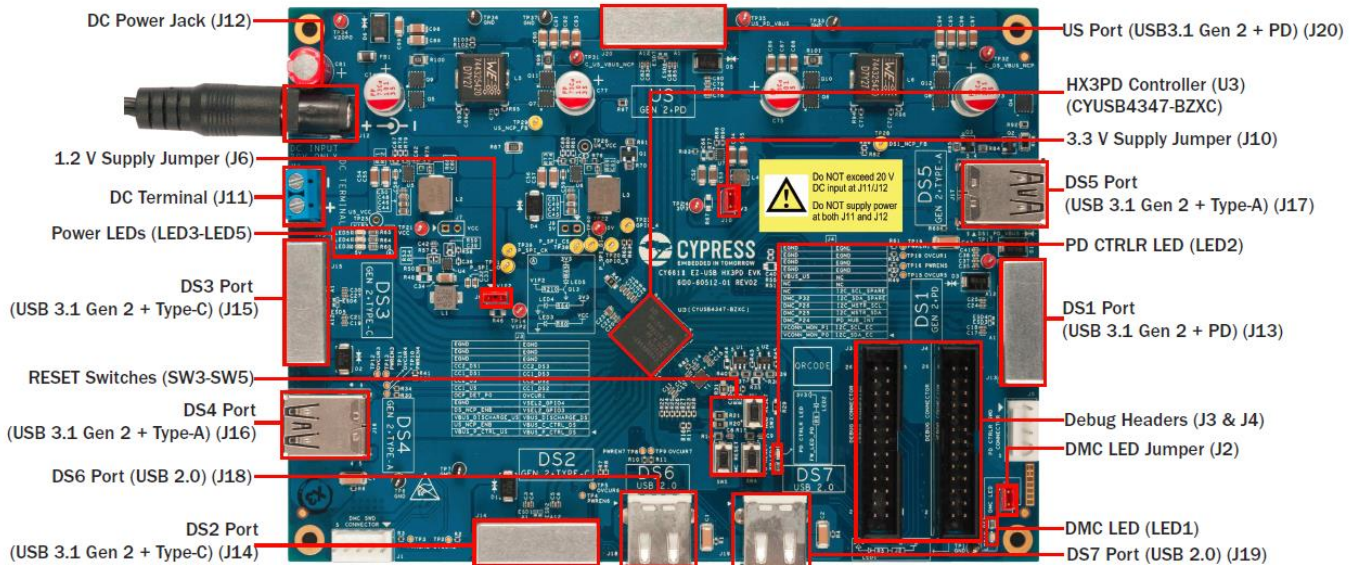


Table 3-2 provides details of the three jumpers available on the CY6611 EVK hardware.

Table 3-2. CY6611 EVK Jumpers

#	Jumper Header	Description	Default State
1	J2	DMC LED Jumper. Jumper to enable DMC LED	Jumper is installed
2	J6	1.2-V Supply Jumper. Jumper to enable 1.2-V supply to the HX3PD controller.	Jumper is installed
3	J10	3.3-V Supply Jumper. Jumper to enable 3.3-V supply to the HX3PD controller	Jumper is installed

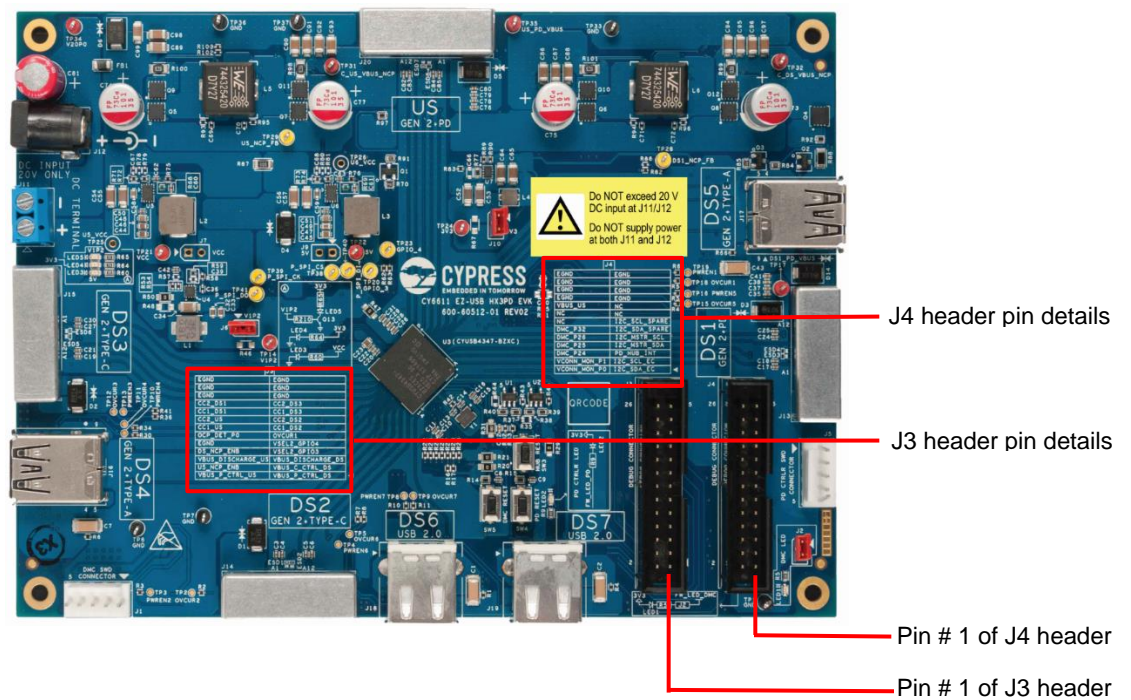


Table 3-3 provides details about the five LEDs available on the CY6611 EVK hardware.

Table 3-3. CY6611 EVK LEDs

#	LED Identifier	Description	States
1	LED1 (DMC LED)	LED to indicate the state of the DMC	Blinks when HX3PD FW is active. Switches between normal and rapid blinks during firmware programming.
2	LED2 (PD CTRLR LED)	LED to indicate the state of the PD controller	Blinks when HX3PD FW is active
3	LED3	LED for the 5.0-V power domain (VCC)	ON when the EVK is powered
4	LED4	LED for the 3.3-V power domain (3V3)	ON when the EVK is powered
5	LED5	LED for the 1.2-V power domain (V1P2)	ON when the EVK is powered

Figure 3-3. CY6611 EVK Headers



CY6611 EVK board has two 26-pin headers (J3 and J4) which provide access to the key pins of the HX3PD controller. The signals terminated on these headers are marked as part of CY6611 EVK board's top side silkscreen as shown in Figure 3-3.

Table 3-4 provides more details about the signals terminated on the J3 header. Note that the pin numbers are arranged matching with the header layout on the CY6611 EVK board.

Table 3-4. J3 Header Details

Pin #	Signal Name	Description	Pin #	Signal Name	Description
26	EGND	Ground	25	EGND	Ground
24					
22					
20	CC2_DS1	CC2 of DS1 port	19	CC2_DS3	CC2 of DS3 port
18	CC1_DS1	CC1 of DS1 port	17	CC1_DS3	CC1 of DS3 port
16	CC2_US	CC2 of US port	15	CC2_DS2	CC2 of DS2 port
14	CC1_US	CC1 of US port	13	CC1_DS2	CC1 of DS2 port
12	OCP_DET_P0	OCP Detection for US	11	OVCUR1	Overcurrent detect for DS1
10	EGND	Ground	9	VSEL2_GPIO4	Reserved
8	DS_NCP_ENB	DS1 PD regulator enable	7	VSEL2_GPIO3	Reserved
6	VBUS_DISCHARGE_US	US VBUS Discharge control	5	VBUS_DISCHARGE_DS	DS1 VBUS Discharge control
4	US_NCP_ENB	US VBUS Consumer path control	3	VBUS_C_CTRL_DS	DS1 VBUS Consumer path control
2	VBUS_P_CTRL_US	US VBUS Provider path control	1	VBUS_P_CTRL_DS	DS1 VBUS Provider path control

Table 3-5 provides more details about the signals terminated on the J4 header. Note that the pin numbers are arranged matching with the header layout on the CY6611 EVK board.

Table 3-5. J4 Header Details

Pin #	Signal Name	Description	Pin #	Signal Name	Description
26	EGND	Ground	25	EGND	Ground
24					
22					
20					
18	VBUS_US	Upstream VBUS	17	NC	No Connection
16	NC	No Connection	15		
14	DMC_P32	GPIO for resetting for Hub Controller	13	I2C_SCL_SPARE	External I2C interface
12			11	I2C_SDA_SPARE	
10	DMC_P26	GPIO for controlling DMC FW LED	9	I2C_MSTR_SCL	I2C to configure the DC-DC regulators which provide power on the PD ports (US and DS1)
8	DMC_P25	Reserved	7	I2C_MSTR_SDA	
6	DMC_P24	GPIO for EEPROM Write Protect enable	5	PD_HUB_INT	Reserved
4	VCONN_MON_P1	GPIO of PD Controller	3	I2C_SCL_EC	I2C SCL for EC
2	VCONN_MON_P0	GPIO of PD Controller	1	I2C_SDA_EC	I2C SDA for EC

### 3.2.3 Measuring Power Consumed by HX3PD Controller

HX3PD is powered by 1.2 V and 3.3 V power domains. The total power consumed by HX3PD can be measured using the following procedure any time during the operation of the kit. Note that this procedure requires two digital multimeters to measure current consumed on 1.2 V and 3.3 V domains simultaneously.

1. Detach the power supply from the CY6611 EVK board.
2. Remove the jumpers installed at jumper headers J6 (1.2-V supply) and J10 (3.3-V supply).
3. Set both the digital multimeters in Ampere mode and attach them to headers J6 and J10.
4. Supply power to the CY6611 EVK board and operate the features of the kit as required. See the [Kit Operation](#) chapter for more details.
5. Measure the current consumed on both 1.2 V (J6) and 3.3 V (J10) domains
6. The total power consumed by HX3PD can be calculated as:

$$\text{HX3PD Power Consumption (mW)} = 1.2 \times (\text{measured current in 1.2V domain}) + 3.3 \times (\text{measured current in 3.3 V domain})$$

# 4 Kit Operation



This chapter describes the procedure to demonstrate the USB 3.1 Gen 2 Hub (10 Gbps), PD 3.0 and Battery Charging (BC 1.2) features supported by the CY6611 EVK. See [Kit Contents](#) for the contents of the kit and [List of Recommended Hardware](#) for additional hardware required to demonstrate these features.

It is recommended that you read this guide in the order that the sections are presented.

## 4.1 Pre-requisites

The following items are needed to perform the kit operations:

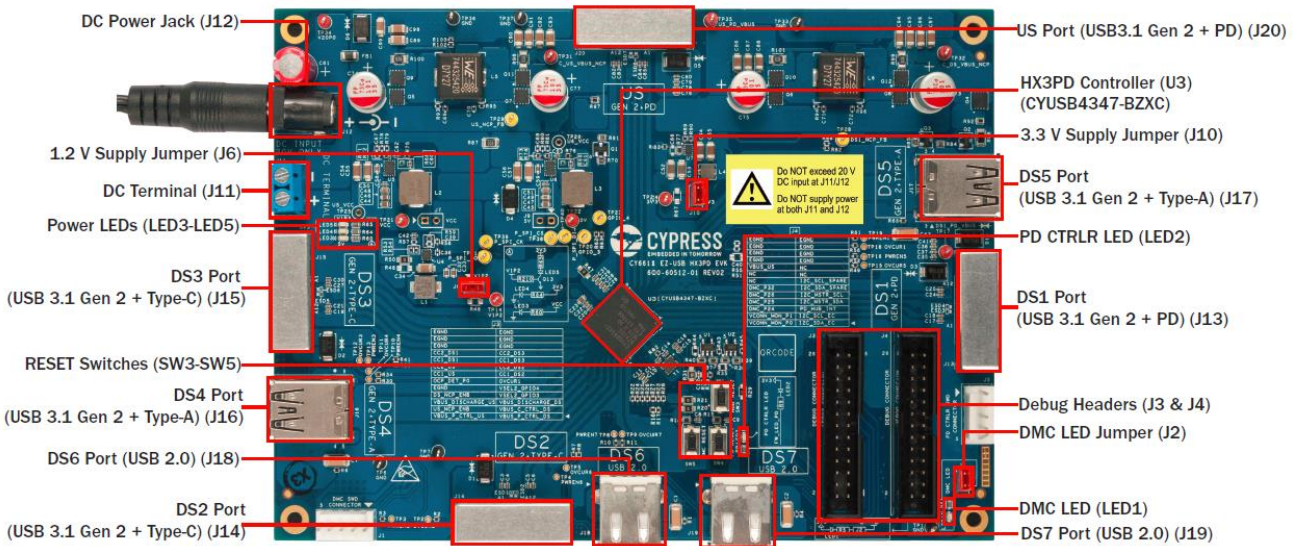
- Items provided with the kit:
  - 19-V, 65.2-W AC/DC power adapter
  - CY6611 EVK board
  - USB Full-Featured Type-C Cable
- Items not provided with the kit:
  - Laptop with USB 3.1 Gen 2 (10 Gbps) and USB PD support
  - USB 3.1 Gen 2 (10 Gbps) Solid State Drives (SSD)
  - USB 2.0 flash drives
  - Multimeter

## 4.2 Powering CY6611 EVK

Follow these steps to power the CY6611 EVK:

1. Unpack the kit package and check the kit contents.
2. Verify that jumpers are installed at J2, J6, and J10 as shown in [Figure 4-1](#).
3. Connect the power adapter provided with the kit to the DC Power Jack (J12) of the CY6611 EVK board. Plug the other end of the power adapter into an AC power socket.
4. Power LEDs (LED3 - LED5) glow green to indicate that the kit is powered. Also, the PD CTRLR LED and DMC LED blink green to indicate that the firmware is running and the kit is ready for operation.

Figure 4-1. CY6611 EVK Hardware Interfaces



**Note:** The maximum power consumed by all ports should not exceed 55 W when used with the power adapter provided with the kit. If the total power requirement for the devices to be connected to the ports of CY6611 EVK exceeds 55 W, use a higher capacity power source to power the kit. The new power source can be a higher capacity power adapter or bench power supply. The power adapter needs to be connected to the kit through the DC Power Jack (J12) and the bench power supply need to be connected on the DC Terminal (J11).

Following is the criteria for the Power Adapter if new Power Adapter with higher capacity is required:

- Maximum output voltage of 20 V
- DC Barrel specification:
  - Polarity: Center Positive
  - Outer diameter: 5.5 mm
  - Inner diameter: 2.1 mm
- Safety approvals such as UL

**Note:** Check and ensure that the power adapter has the necessary safety approvals required for the country where it is used

**Important Notes**

- Do not supply power to the CY6611 kit hardware at both the power interfaces (J12 and J11). Doing so may damage the kit hardware.
- Make sure that bench power supply is connected to the kit hardware (J11) as per the marked polarity. Also, ensure that the maximum output from the bench power supply does not exceed 20 V.
- Make sure that the DC plug of the power adapter is of 'Center Positive' type. Using a power adapter with incorrect polarity may permanently damage the kit hardware.

### 4.2.1 Troubleshooting

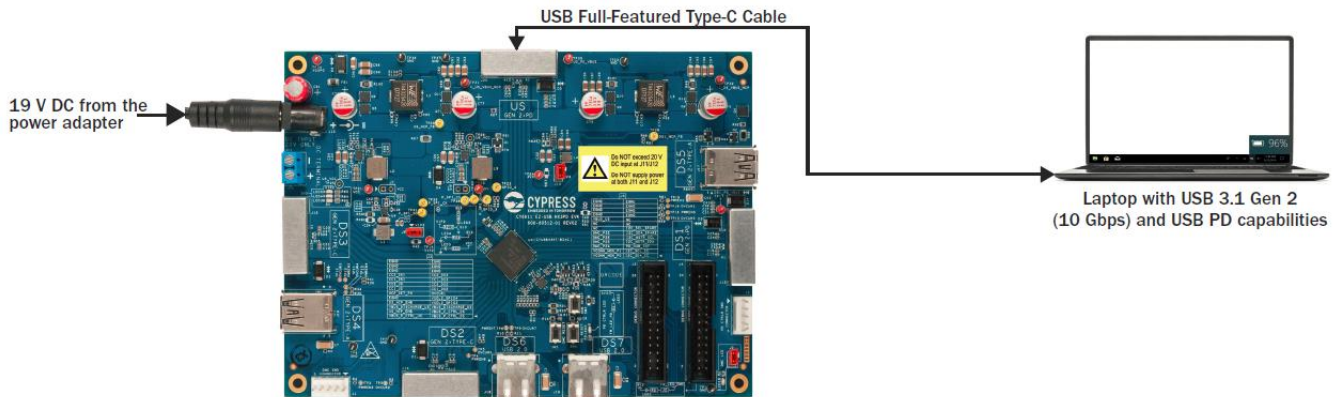
Table 4-1. Procedure to Troubleshoot Issues with Powering of CY6611 EVK

#	Issue	Possible Cause	Troubleshooting Procedure
1	Power LEDs (LED3-LED5) are not glowing	Incompatible power adapter	If an AC-DC power adapter which is not provided with the kit is being used, it may not be a compatible adapter. See the <a href="#">Powering CY6611 EVK</a> section to understand the selection criteria for the power adapter.
		Jumpers are not populated	Ensure that jumpers are installed on J6, and J10 headers.
2	PD CTRLR, DMC, or both LEDS are not glowing	HX3PD kit hardware may not have been loaded with correct firmware	Download the correct HX3PD firmware on the kit hardware. See the <a href="#">Programming the HX3PD Controller</a> chapter for more details.
		Jumper is not populated	Ensure the jumper is installed on J2 header

### 4.3 Connecting EVK to Laptop

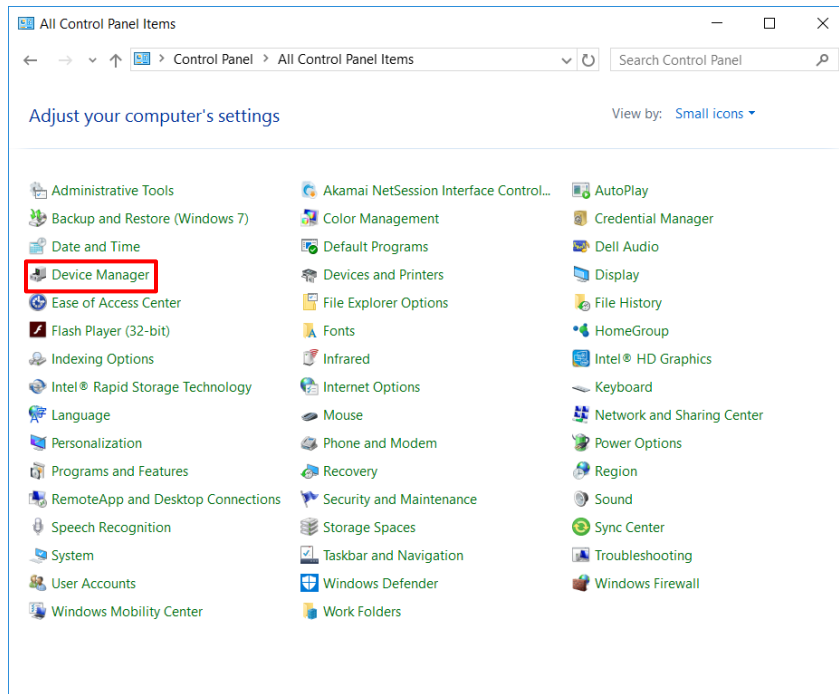
1. Connect the Type-C cable provided with the kit to the CY6611 EVK board's US port. Connect the other end of the Type-C cable to the Type-C port on a laptop supporting USB 3.1 Gen 2 (10 Gbps) and USB PD.

Figure 4-2. Connecting the CY6611 EVK to Laptop



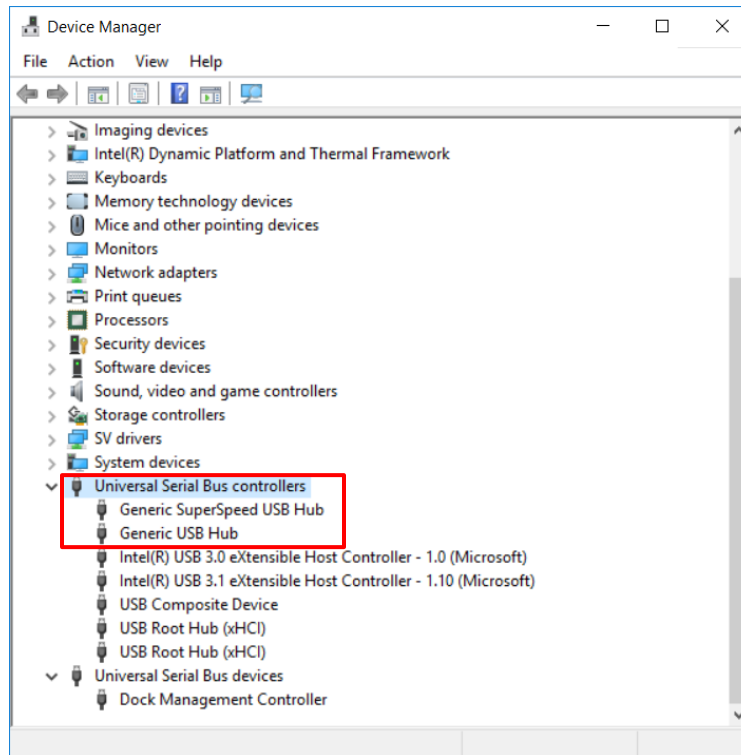
2. Open **Control Panel** on laptop. From the **Control Panel** window, click **Device Manager**. See [Figure 4-3](#). Note that the screenshots are captured on a laptop running Windows 10. If you are running on a different OS, screenshots may differ.

Figure 4-3. Invoking Device Manager on a Windows 10 Laptop



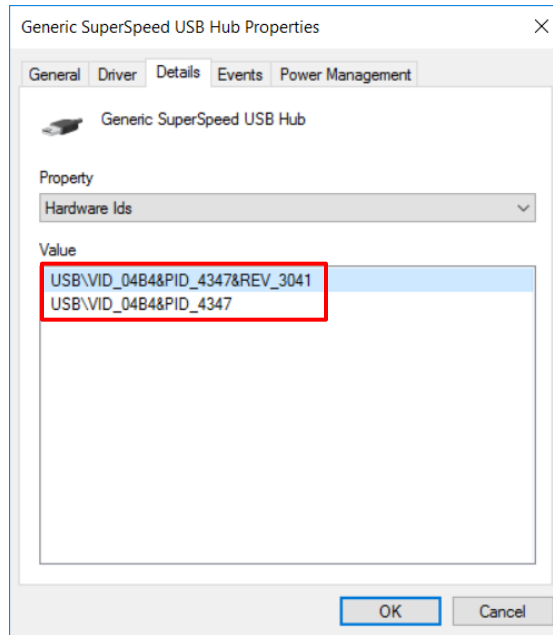
- Expand **Universal Serial Bus controllers** to see the list of USB devices attached to the laptop. The evaluation kit is listed as **Generic SuperSpeed USB Hub** and **Generic USB Hub**.

Figure 4-4. Enumeration of HX3PD on the Laptop



- Right-click **Generic SuperSpeed USB Hub** and open **Properties**. Go to the **Details** tab and choose **Hardware Ids** from the **Property** drop-down list. The Cypress VID and PID are displayed as shown in [Figure 4-5](#).

Figure 4-5. CY6611 VID and PID



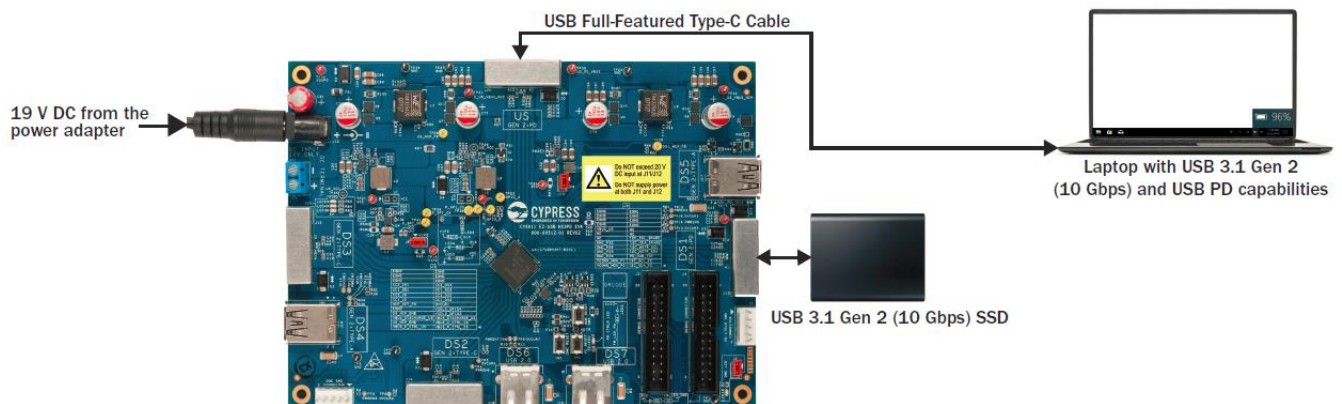
## 4.4 Demonstrating USB 3.1 Gen 2 (10 Gbps) Data Transfer

This section demonstrates the USB 3.1 Gen 2 (10 Gbps) data transfer capability of the HX3PD controller using the CY6611 EVK. This section also demonstrates the procedure for USB 2.0 transfer.

See [CY6611 Hardware Design Overview](#) to understand the capabilities supported by the DS ports and US port of the HX3PD controller.

- Get a USB 3.1 Gen 2 (10 Gbps) certified Solid State Drive (SSD) and store a 5 GB file.
- Connect the drive to any of the five USB Gen 2 DS ports (DS1 to DS5) as shown in [Figure 4-6](#) using the USB cable provided with the SSD.

Figure 4-6. USB 3.1 Gen 2 Data Transfer Setup

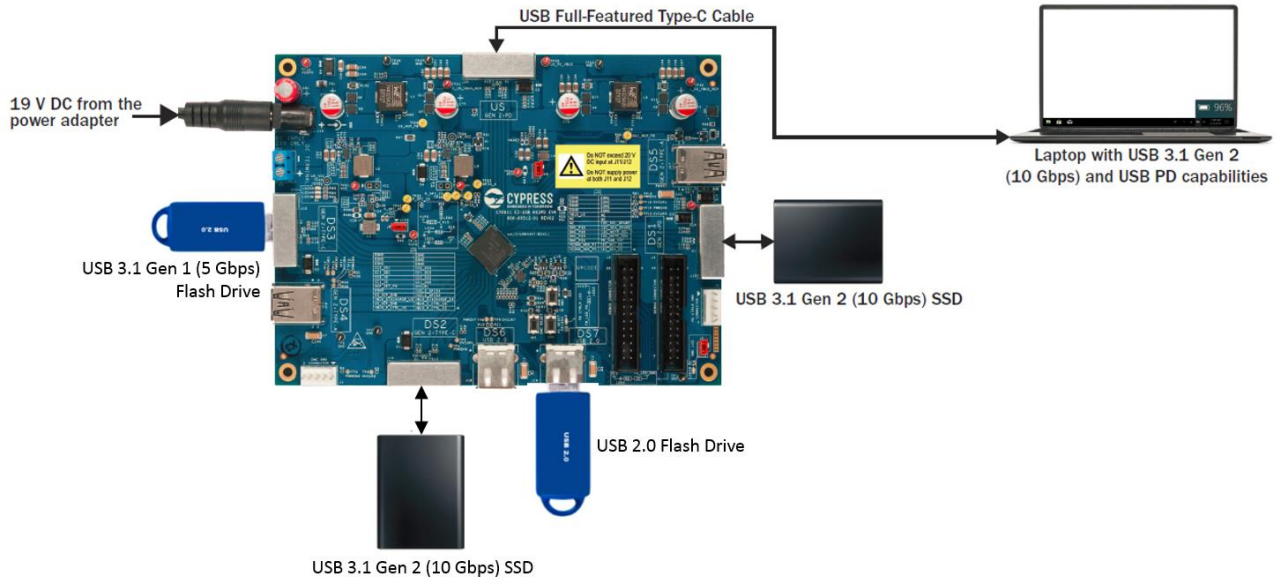


**Note:** CY6611 EVK's DS1-DS3 ports are Type-C USB connectors and DS4-DS5 ports are Type-A USB connectors. Pick the DS port (DS1-DS5) for connecting the SSD based on the connector type supported by the USB cable provided with the SSD.



3. Copy the 5 GB file from the drive to the laptop to transfer data in the USB 3.1 Gen 2 (10 Gbps) mode. Note that the actual data transfer rate observed on the laptop may vary based on the hardware/software configuration of the laptop and the SSD used.
4. Connect more drives (USB 3.1 Gen 2, USB 3.1 Gen 1, or USB 2.0) to other DS ports to check multiple types of data transfers simultaneously. See [Figure 4-7](#) for a sample set up.

Figure 4-7. USB 3.1 Gen 2, USB 3.1 Gen 1 and USB 2.0 Devices Connected to DS Ports



#### 4.4.1 Troubleshooting

Table 4-2. Procedure to Troubleshoot Issues with Data Transfer Operation

#	Issue	Possible Cause	Troubleshooting Procedure
1	Data transfer is not happening at USB 3.1 Gen 2 (10 Gbps) speed	The USB 3.1 Gen 2 SSD may not have been connected to a USB 3.1 Gen 2 port.	Ensure that the SSD is connected to one of the DS ports (DS1 to DS5) which support USB 3.1 Gen 2 data transfer.
		The SSD may be non-compliant with USB 3.1 Gen 2 standard	Ensure that a USB 3.1 Gen 2 certified SSD is used.
		Multiple simultaneous data transfers may be happening which will result in sharing of the USB bus bandwidth.	Stop all data transfers on the USB bus except the one to be used for demonstrating USB 3.1 Gen 2 data transfer speed.
2	Detaching a mass storage device (USB 3.1 Gen 2/ Gen 1 / USB 2.0) from a DS port while data transfer is in progress causes data transfers happening on other DS ports to stop	The Operating System running on the host PC may have issues with handling device detach events on USB	Check for the latest OS updates and install those updates on the host PC and check

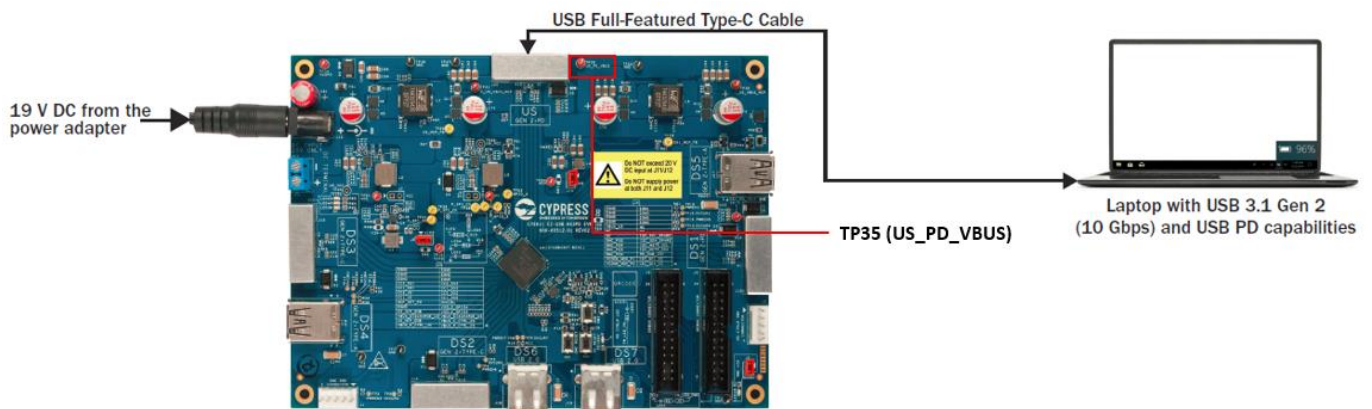
## 4.5 Demonstrating USB PD Charging on US and DS1 Ports

This section demonstrates the USB PD charging feature on US and DS1 ports of CY6611 HX3PD.

See [CY6611 Hardware Design Overview](#) to learn about USB data transfer and charging capabilities supported by HX3PD EVK's US and DS ports.

1. If the CY6611 EVK has been used to demonstrate USB 3.1 Gen 2 data transfer as described in the earlier sections, do the following steps to prepare the CY6611 EVK for the USB PD charging demo:
  - Detach the power supply from the CY6611 EVK board
  - Detach the SSD and other drives from the DS ports
2. Connect the Type-C cable provided with the kit to CY6611 EVK boards' US port; connect the other end of the Type-C cable to the Type-C port on a laptop supporting USB PD and USB 3.1 Gen 2 (10 Gbps) as shown in [Figure 4-8](#). Ignore this step if CY6611 EVK is already connected to the laptop.
3. Supply power to the CY6611 EVK using any of the following three sources:
  - Power Adapter provided with the kit
  - An alternate power adapter with higher output capacity
  - Using Bench power supply
4. Power LEDs (LED3 - LED5) glow green to indicate that the kit is powered. Also, the PD CTRLR LED and DMC LED blink green to indicate that the firmware is running and the kit is ready for operation.
5. The laptop starts charging once the USB PD contract is established. This can be verified on the display of the laptop (for example, Battery Charging status in System Tray area on a Windows laptop). Measure the PD contract voltage at test point TP35 (US\_PD\_VBUS) using a multimeter as shown in [Figure 4-8](#).

Figure 4-8. USB PD Charging Setup



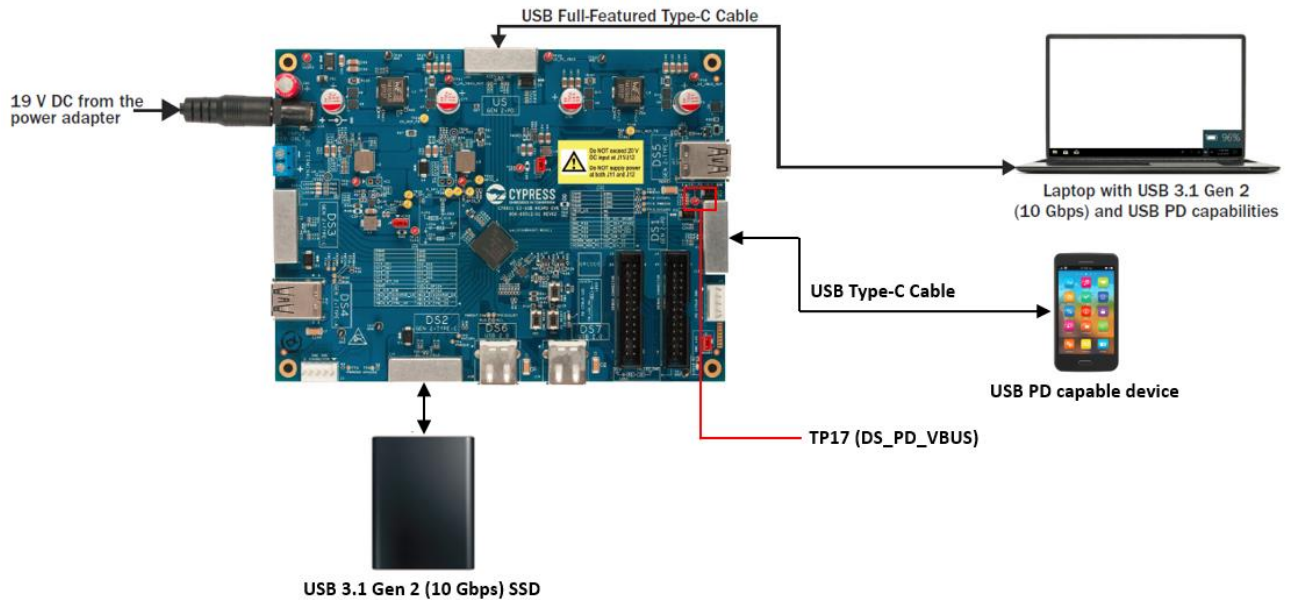
6. Connect a USB PD capable device (for example, mobile phone) on the DS1 port using the USB Type-C cable provided with the device. The device starts charging once the PD contract is established. Measure the PD contract voltage at test point TP17 (DS\_PD\_VBUS) as shown in [Figure 4-9](#).

**Note:** The CY6611 firmware is configured to support a maximum of 20 V, 2.3 A power on the US port and 5 V, 1 A power on the DS1 port. The CY6611 firmware can be configured to support a maximum power of 20 V, 3 A on both US and DS1 ports simultaneously. See the [Programming the HX3PD Controller](#) chapter to configure the HX3PD firmware for this requirement.

7. Simultaneous USB Gen 2 data transfer and USB PD charging can be demonstrated by connecting a USB Gen 2 SSD to any of the remaining USB Gen 2 DS ports (DS2-DS5) and initiating data transfer from the laptop (which is getting charged using the USB PD protocol) as shown in [Figure 4-9](#).

**Note:** DS1-DS3 ports use Type-C USB connector and DS4-DS5 ports use Type-A USB connector. Pick the DS port (DS2-DS5) to connect the SSD, based on the connector type supported by the USB cable provided with the SSD.

Figure 4-9. Simultaneous USB PD Charging and USB 3.1 Gen 2 Data Transfer



**Note 1:** USB Battery Charging Specification (BC 1.2) and Apple charging features are enabled on DS2 to DS5 ports by default. The devices which support USB BC 1.2 (for example, smartphone with BC 1.2 support) or Apple charging can be connected to these ports anytime to charge them. These charging protocols are supported simultaneously with USB 3.1 Gen 2 data transfer and USB PD charging features.

**Note 2:** HX3PD can also support Battery Charging (BC 1.2) and Apple charging features on DS6 and DS7 ports with custom firmware. Contact [Cypress Technical Support](#) for the custom firmware.

### 4.5.1 Troubleshooting

Table 4-3. Procedure to Troubleshoot issues with USB PD Charging and USB Gen 2 Data Transfer Demonstration

#	Issue	Possible Cause	Troubleshooting procedure
1	Laptop connected to the CY6611 EVK's US port is not charging	The laptop may not support USB PD protocol	Check the technical specification of the laptop and confirm that it supports USB PD 2.0 or 3.0 protocol
2	The device (for example, mobile phone) connected on CY6611 EVK's DS1 port is not charging	The device may not support USB PD protocol	Check the device's technical specification and confirm that it supports USB PD 2.0 or 3.0 protocol
		The device's implementation may require higher voltage PD contract to be established with CY6611 EVK to enable charging	The CY6611 firmware is configured to support 5 V, 1 A PD contract on DS1 by default. The CY6611 firmware can be configured to support charging at higher voltage levels. See the <a href="#">Programming the HX3PD Controller</a> chapter to configure the HX3PD firmware for this requirement and to download it on the CY6611 kit.

# 5 Programming the HX3PD Controller



## 5.1 EZ-USB HX3PD Configuration Utility Overview

The EZ-USB HX3PD Configuration Utility is a Microsoft Windows based utility that enables configuration of the HX3PD firmware and programming the HX3PD controller with the firmware. See the utility's Release Notes *EZ-USB HX3PD Configuration Utility Release Notes.pdf* available at `<Install_Directory>\EZ-USB HX3PD Configuration Utility\Documentation\` to understand the PC/laptop's system requirements to run this utility.

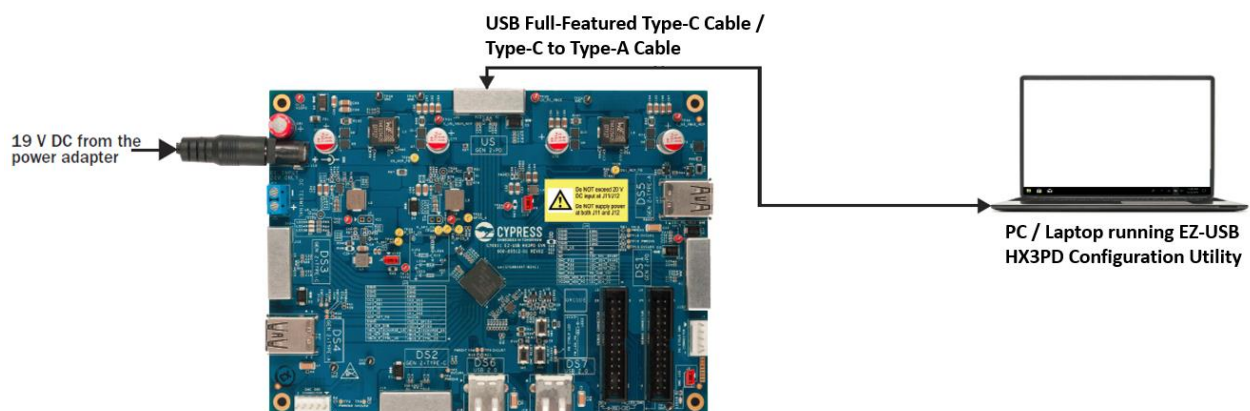
**Note:** On Windows 32-bit platforms, the default `<Install Directory>` is `C:\Program Files\Cypress` and on Windows 64-bit platforms, it is `C:\Program Files (x86)\Cypress`

## 5.2 Programming the HX3PD Firmware

Follow these steps to download the HX3PD firmware on the CY6611 EVK:

1. If the CY6611 EVK was used to demonstrate USB 3.1 Gen 2 data transfer or charging features (PD/BC) as described in the [Kit Operation](#) chapter, follow the steps to prepare the CY6611 EVK for programming the HX3PD firmware:
  - Detach the power supply from the CY6611 EVK board.
  - Detach the SSD and other drives/devices from the DS ports.
2. Connect the power adapter provided with the kit to the DC Power Jack (J12) of the CY6611 EVK board. Plug the other end of the power adapter into an AC power socket.
3. Identify the USB port on the PC/laptop to which the CY6611 EVK will be connected. It is recommended to connect the CY6611 EVK to a Type-A port of the PC/laptop using a Type-C to Type-A cable. Otherwise, use the USB Full-Featured Type-C Cable, provided with the EVK, to connect CY6611 EVK to the Type-C port of the PC/laptop.

Figure 5-1. HX3PD Firmware Programming Setup

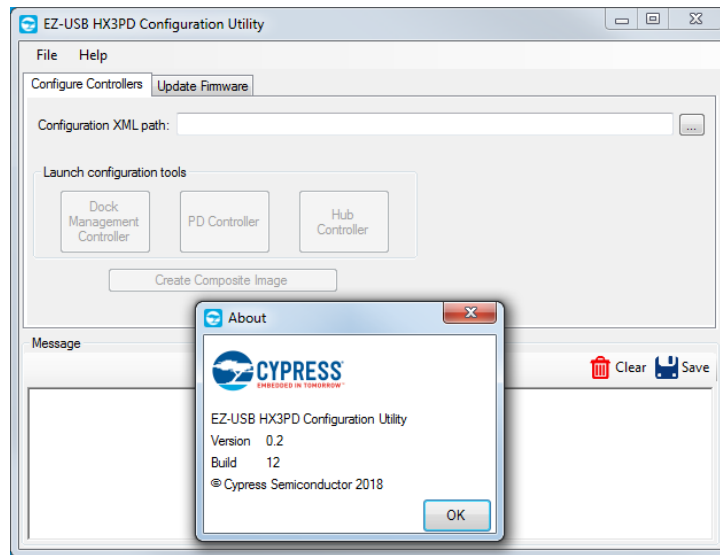


**Note:** If the laptop on which the HX3PD Configuration Utility will run is powered by the CY6611 EVK, make sure that laptop's battery is adequately charged for at least 10 minutes of continuous operation. Note that the HX3PD controller goes through reset cycles during the firmware download operation and the power provided by the EVK on US port to the laptop as per the USB PD protocol will momentarily get cut off till the newly downloaded firmware comes up. This transition can be observed on the System Power Status displayed by laptop's operating system.

- Launch the HX3PD Configuration Utility as shown in [Figure 5-2](#). The HX3PD Configuration Utility is available at `<Install_Directory>\EZ-USB HX3PD Configuration Utility\EZ-USB HX3PD Configuration Utility.exe`. Click **Help > About** to get the version number details of the utility.

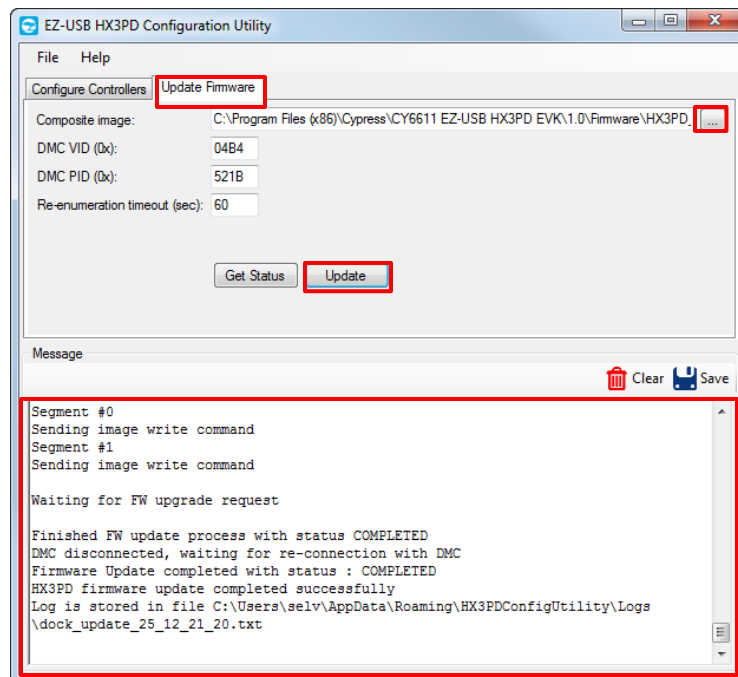
**Note:** On Windows 32-bit platforms, the default `<Install Directory>` is `C:\Program Files\Cypress`, and on Windows 64-bit platforms, it is `C:\Program Files (x86)\Cypress`.

Figure 5-2. HX3PD Configuration Utility with Version Details



- Go to the **Update Firmware** tab and specify the path to the HX3PD firmware file in the **Composite image** field as shown in [Figure 5-3](#). Retain the default values for the other fields. The HX3PD firmware is available at `<Install_Directory>\CY6611 EZ-USB HX3PD EVK1.0\Firmware\HX3PD_Composite_FW\CYUSB4347-BZXC_FW.bin`. Click **Update** to initiate programming of the HX3PD firmware.

Figure 5-3. Programming the HX3PD firmware



Log Pane with firmware programming status

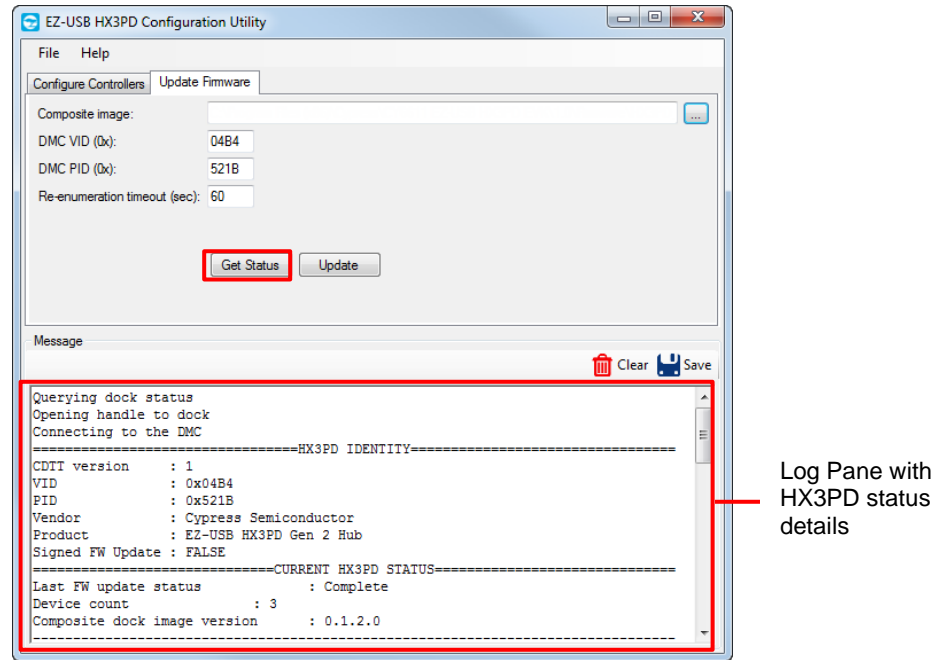
Retain the default values for the other input fields available in the **Update Firmware** tab (DMC VID, DMC PID, and Re-enumeration timeout). Re-enumeration timeout refers to the maximum time for which the Utility will wait for HX3PD to restart using the newly downloaded firmware and to start communication with the Utility.

The status of the firmware programming is displayed in the Log Pane. Also, the DMC LED will go through rapid and normal blink sequences alternately during the firmware programming activity.

The firmware programming will complete in about three minutes. On successful programming, the message “HX3PD firmware update completed successfully” will be displayed in the Log Pane.

- EZ-USB HX3PD Configuration Utility also supports a feature to query the status of the HX3PD. The status details include the VID, PID, Vendor Name, Product Name, version number of the HX3PD firmware, and the result of last firmware upgrade operation. Click **Get Status** on the **Update Firmware** tab as shown in Figure 5-4. The status details are displayed in the Log Pane area.

Figure 5-4. Get the firmware status of HX3PD



**Note:** The **Get Status** feature can be invoked any time to understand the status of HX3PD.

### 5.3 Updating the HX3PD Configuration and Generating a Composite Image

The HX3PD firmware can be configured based on the CY6611 EVK usage requirements. For example, the default USB PD PDO of 5-V, 1-A supported on DS1 port can be modified to support 20-V, 2.25-A. See the EZ-USB HX3PD Configuration Utility User Guide to understand the procedure. You can access the user manual from the utility's **Help** menu.

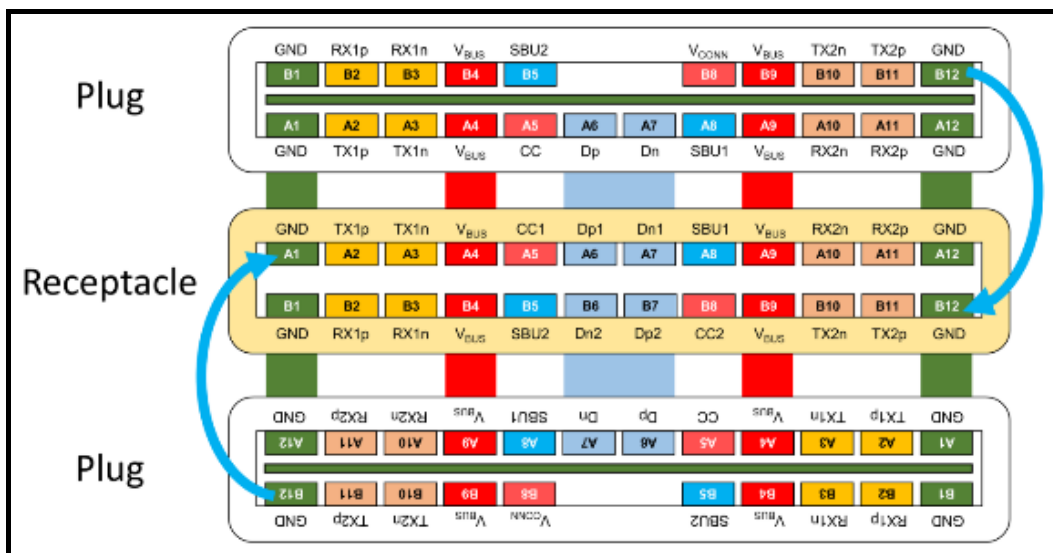
# Appendix A: Terminology



A brief description on USB, USB Charging specification, USB Type-C, and USB PD terms are provided for reference.

- **USB Type-C (Type-C):** The new USB connector specification for a slimmer and reversible connector, with extended power handling capability. The new connector supports latest USB and power delivery specifications. The connector is backward compatible with the previous USB specifications.
- **USB PD (USB Power Delivery):** A new USB standard that increases power delivery over USB from 7.5 W to 100 W.
- **Upstream Facing Port (UFP):** A USB Type-C port on a device or a hub that connects to a host or the Downstream Facing Port (DFP) of a hub and a default power sink.
- **Host:** A USB host system such as a PC.
- **VBUS:** A USB Type-C bus wire used for power; initially 5 V, but increased up to 20 V on USB PD systems.
- **DFP:** A USB Type-C port on a host or a hub that connects to a device.
- **USB 3.1 Gen 2:** Latest USB specification that supports a transfer speed of up to 10 Gbps. Also called USB 3.1.
- **BC1.2 (USB Battery Charging Specification v1.2):** The latest version of USB based charging protocol.
- **SuperSpeed (SS), High-Speed (HS), Full-Speed (FS), Low-Speed (LS):** The USB protocol support various transfer speeds. Low-Speed (1.5 Mbps) and Full-Speed (12 Mbps) were introduced with first version of USB specification (USB 1.1). High-Speed (USB 2.0) supports a transfer speed of up to 480 Mbps. Super Speed introduced by the USB 3.x specification, supports 5 Gbps (USB 3.1 Gen 1) and 10 Gbps (USB 3.1 Gen 2).
- **Fast Role Swap (FRS):** Ability of a Dual Role Port (DRP) to switch power roles between sink and source. The FRS was introduced with latest power delivery specification (USB PD v3.0).

Figure A-1: USB Type-C Plug and Receptacle



# Revision History



## Document Revision History

Document Title: CY6611 EZ-USB HX3PD Evaluation Kit Guide Document Number: 002-26068			
Revision	ECN#	Issue Date	Description of Change
**	6890431	06/01/2020	Initial version of kit guide
*A	6906163	06/26/2020	Updated Abbreviations. Detailed Installation to specify the following: Installing the EZ-PD Configuration Utility Installing the EZ-USB HX3PD Configuration Utility CY6611 EZ-USB HX3PD EVK Software Installation Cypress Update Manager Check Updated CY6611 System Design. Added Troubleshooting points in Table 4-1 and Table 4-2. Added note in Demonstrating USB PD Charging on US and DS1 Ports.