CY4531

EZ-PD™ CCG3 Evaluation Kit Guide

Doc. No. 002-10218 Rev. *B

Contents

Safety Information

The CY4531 EZ-PD™ CCG3 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 CY4531 EZ-PD CCG3 EVK as shipped from the factory has been verified to meet with requirements of CE as a Class A product.

	The CY4531 EZ-PD CCG3 Evaluation Kit Guide boards contain ESD-sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, which can cause a discharge without detection. Permanent damage may occur to devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused CY4531 EZ-PD CCG3 Evaluation Kit Guide boards in the protective shipping package.
	End-of-Life/Product Recycling The end-of-life cycle for this kit is five years from the date of manufacture mentioned on the back of the box. Contact the nearest recycler to discard the kit.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. Cypress recommends that the user 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

The boards provided with CY4531 EZ-PD CCG3 Evaluation Kit are sensitive to ESD. This also applies to the boards that are provided with a plastic casing when they are removed from the casing. Hold the boards only by the edges. After removing a board from the box/casing, 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

The CY4531 EZ-PD™ CCG3 Evaluation Kit (EVK) is based on the CCG3 product family of Cypress's USB Type-C microcontrollers. This EVK is primarily intended to be an evaluation vehicle for USB Type-C host and client systems that house a Type-C connector as well as for notebook applications. For USB Power Delivery (PD), the base board and daughter card can be configured as a downstream facing port (DFP) or an upstream facing port (UFP). The kit also serves as a vehicle to evaluate several features for Type-C, using a SuperSpeed USB demo and a DisplayPort demo, as examples.

1.1   Kit Contents

The CY4531 EZ-PD CCG3 EVK consists of the following contents:

- CCG EVK Base Board

- CY4531 CCG3 Daughter Card (mounted on CCG EVK Base Board)

- 24-V DC 65 W Power Adapter (24 V, 2.7 A)

- USB 3.0 Type-A to Type-B cable

- USB Type-C to Type-A adapter

- USB 3.1 EMCA (Electronically Marked Cable Assembly) Type-C cable

- USB 2.0 Type-A to Mini-B Cable

- Quick Start Guide

1.1.1   Hardware Not Included With Kit

The CY4531 EZ-PD CCG3 EVK does not come with all of the hardware needed to perform the demonstrations documented in sections SuperSpeed USB Demo, DisplayPort Demo, and Dead Battery Demo of the Kit Operation chapter. The following items are not included:

- USB flash drive needed for the SuperSpeed USB Demo section.

- DisplayPort cables needed for the DisplayPort Demo section. They are required to make connections from a PC to the CCG EVK base board. If the PC has a mini-DisplayPort, then a mini-DisplayPort to DisplayPort cable will be required. If the PC has a DisplayPort, then a DisplayPort to DisplayPort cable will be required. Recommended cables are listed in Recommended Cables and Adapters section.

- USB Type-C to DP/HDMI/VGA adapter to connect a display monitor to the CY4531 EZ-PD CCG3 EVK. Recommended adapters and cables needed for them to connect to monitors are listed in Recommended Cables and Adapters section.

- A digital multimeter to measure voltage for the Dead Battery Demo section. A standard multimeter is required to measure the output voltage on the CCG base board to successfully demonstrate dead battery functionality along with a USB Type-C Power Adapter.

1.2 Getting Started

For instructions on how to run a quick demonstration and observe kit functionality, refer to the SuperSpeed USB Demo section. This section also provides complete instructions on configuring the CY4531 EZ-PD CCG3 EVK base board and daughter card.

1.3 List of Recommended Hardware

1.3.1 Recommended Cables and Adapters

See Table 1-1 to obtain a set of cables recommended to work with this kit. This kit is not shipped with these cables and adapters and they are required to run the DisplayPort Demo and Dead Battery Demo.

Table 1-1. List of Recommended Cables and Adapters

No.	Description	Manufacturer	MPN	Vendor Link
1	DisplayPort to DisplayPort Cable (6", gold plated)	Cable Matters	102005-6	Amazon Link
2	Mini DisplayPort to DisplayPort Cable (3", gold plated)	Cable Matters	101007-BLACK-3	Amazon Link
3	Type-C to Display Port Adapter	Belinda	-	Amazon Link
4	Type-C to HDMI Adapter	Cable Matters	-	Amazon Link
5	Type-C to VGA Adapter	Cable Matters	-	Amazon Link
6	Type-C Power Adapter that supports 9V or above	Apple	-	Apple Store Link

Use item 1 or 2 in Table 1-1 to connect the PC's DisplayPort or Mini-DisplayPort to the DisplayPort of CY4531 EZ-PD CCG3 EVK. Depending on the display monitor you have, use item 3, 4 or 5 in Table 1-1 to connect from the USB Type-C port of the CY4531 EZ-PD CCG3 EVK to the display monitor itself. Use item 6 to run the Dead Battery Demo.

1.4 Acronyms

Table 1-2. Acronyms Used in this Document

Acronym	Definition
ADC	analog-to-digital converter
CC	configuration channel
DFP	downstream facing port
DRP	dual role port
EC	embedded controller
EMCA	electronically marked cable assembly
EMI	electromagnetic interference
ESD	electrostatic discharge
EVK	evaluation kit
FET	field-effect transistor
GPIO	General-purpose input/output
HID	human interface device
HPD	hot plug detect

Acronym	Definition
IC	integrated circuit
I^{2}C	inter-integrated circuit
IDE	integrated development environment
LED	light-emitting diode
PSoC$^®$	Programmable Systems-on-Chip
PWM	pulse-width modulation
QFN	quad flat no-lead (package)
SWD	serial wire debug
UART	universal asynchronous receiver transmitter
UFP	upstream facing port
USB	Universal Serial Bus
USB PD	Universal Serial Bus Power Delivery
XRES	External Reset I/O Pin

2. Kit Installation

This chapter describes how to perform the installation steps for the CY4531 EZ-PD CCG3 EVK.

2.1 CY4531 EZ-PD CCG3 EVK Kit Software Installation

To install the kit software, follow these steps:

a. Download the latest kit software setup file "CY4531 EZ-PD CCG3 EVK Complete Setup" from the kit's website: www.cypress.com/CY4531. This package contains the kit hardware files and the kit documentation (User Guide, Quick Start Guide, and Release Notes). Double-click on the executable to start the installation. Click **Next** when the screen shown in Figure 2-1 appears.

Figure 2-1. CY4531 EZ-PD CCG3 EVK Installer Screen
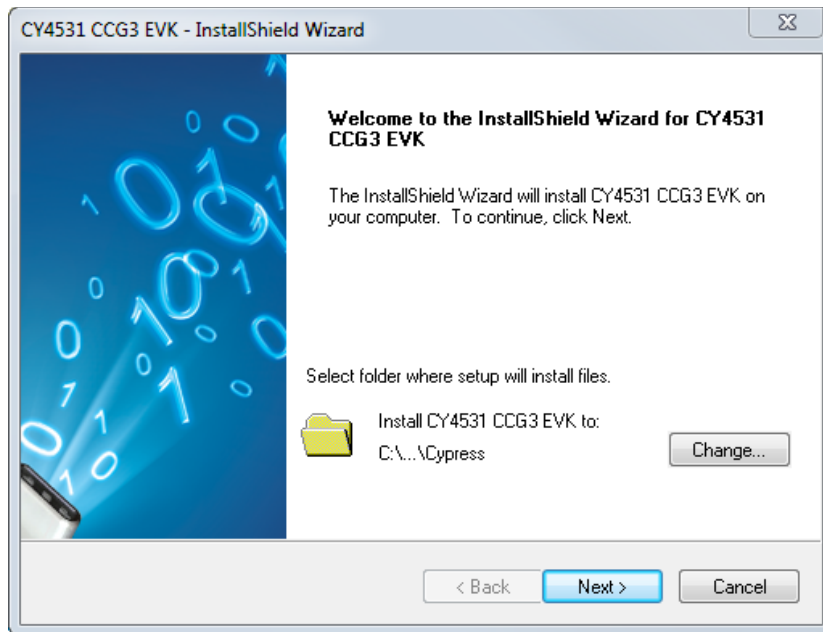
b. Select the required **Installation Type** and click **Next** to start the install (Figure 2-2). For first-time installation, it is recommended that you select "Typical" as the **Installation Type**.

Figure 2-2. Installation Wizard

c.   Accept the license agreement for the software components and click **Next** (Figure 2-3).

Figure 2-3. License Agreement
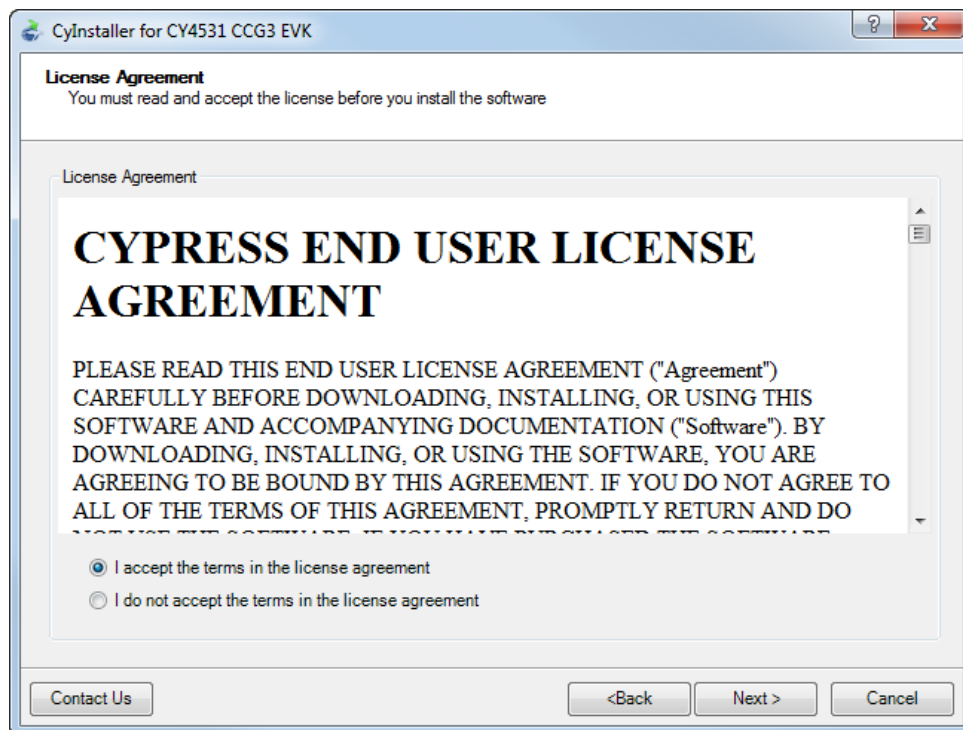
d.   Figure 2-4 shows the installation progress.

Figure 2-4. Installation Progress
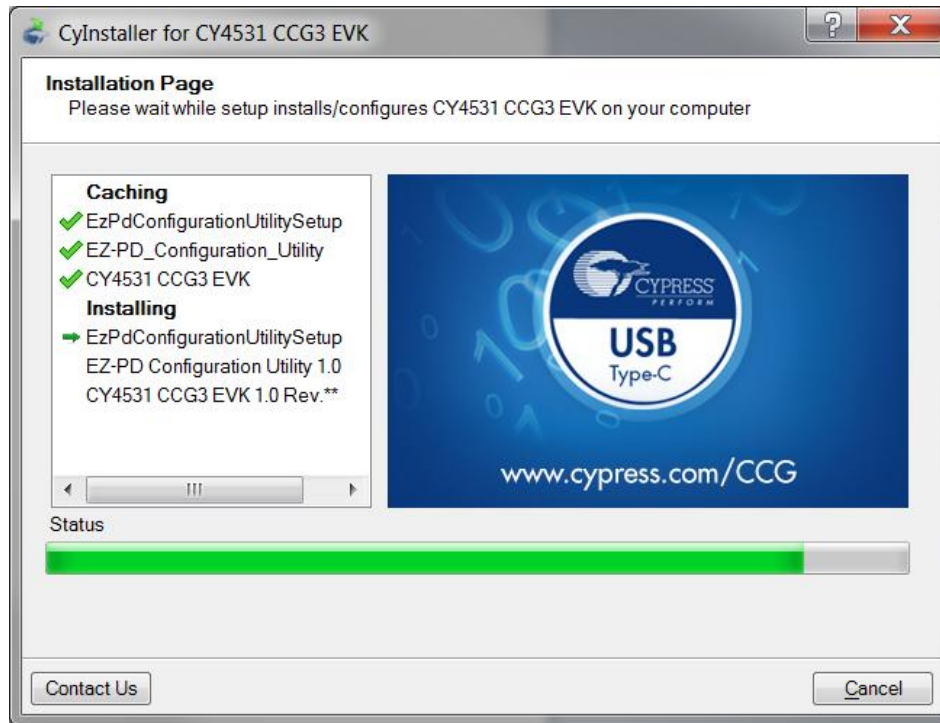
e.   Click **Finish** when complete (Figure 2-5).

Figure 2-5. Software Installation Complete

f.   When installation is complete, you have the option to **Launch Cypress Update Manager** (Figure 2-6) to ensure you have the latest software package. Click the **Check for updates** button at the bottom of the window. If "No Updates" appears adjacent to the CY4531 EZ-PD CCG3 EVK, click the **Exit** button. If there are updates, click the **Update** button to download and install the latest kit package.

Figure 2-6. Cypress Update Manager
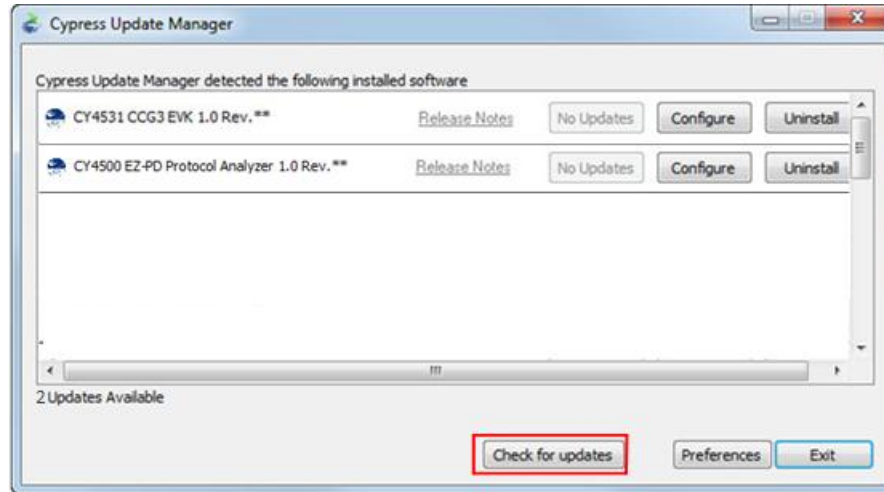
Note: You can launch the Cypress Update Manager at any time from **Start > All Programs > Cypress > Cypress Update Manager**.

g.   After the installation is complete, the contents are available at the following location: `<Install Directory>\CY4531 CCG3 EVK\1.0.`

Note: 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. CY4531 EZ-PD CCG3 EVK Hardware Details

The CY4531 EZ-PD CCG3 EVK consists of a base board and a daughter card. The CCG3 device is mounted on the daughter card, which is connected to the base board to evaluate the CCG3 device's Type-C port functionality as shown in Figure 3-1.

Figure 3-1: CY4531 EZ-PD CCG3 EVK Architecture

DP – DisplayPort
PS – Power Supply
USB2 – Used only for programming
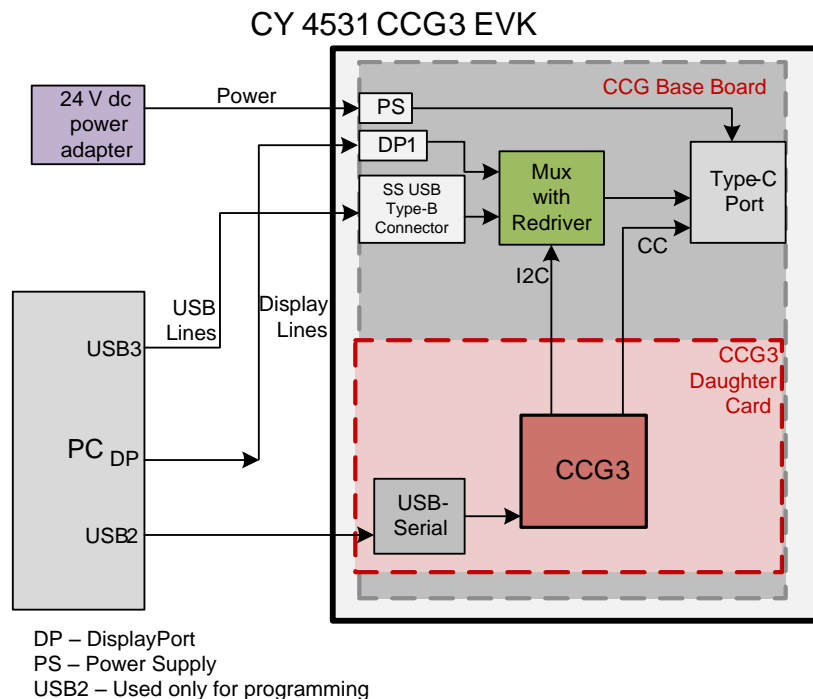
The CCG base board consists of a DC input power supply, a Display multiplexer, one Display port, a SuperSpeed Type-B port, and one Type-C port. The CCG3 daughter card consists of the CCG3 device and a USB-Serial IC to provide a USB interface for debugging and programming. The CC lines of the CCG3 device are connected to the Type-C port. The Display multiplexer is controlled by the CCG3 device over an I^2C interface.

The CY4531 EZ-PD CCG3 EVK has a power provider and consumer path control circuitry to showcase EZ-PD CCG3's ability to switch its power role from a provider to a consumer and vice versa. This EVK has over-voltage and over-current protection circuitry for VBUS and it also supports programming of the EZ-PD CCG3 device over SWD and I^2C interfaces. The EVK supports PCs, notebooks, tablets, and other applications that would host a Type-C interface. It is primarily intended as an evaluation vehicle for USB host systems that house a Type-C connector.

3.1 CCG EVK Base Board

The CCG EVK base board is an evaluation board equipped with a Type-C port, a SuperSpeed USB Type-B port, and a Display Port interface. It is primarily intended as a demonstration board for notebook designs that house a Type-C connector. The board also serves as a vehicle to evaluate the alternate modes for Type-C, using the DisplayPort demo as an example.

3.1.1 Block Diagram

The block diagram of the CCG EVK Base board is shown in Figure 3-2. It has an on-board Type-C connector for the USB-PD interface and a CCG3 daughter card interface connector to connect the CCG3 daughter card. It also includes a SuperSpeed USB Type-B port, and a Display Port connector to source video. The SuperSpeed USB signals and Display Port signals are connected to the Type-C connector through a high-speed multiplexer controlled by the CCG3 device. A DC power adapter provides input voltage to the onboard Power Management IC (PMIC). The output voltage from the PMIC can be selected using two voltage selection lines, controlled by the CCG3 device. This CCG base board along with the CCG3 daughter card helps to convert any desktop or notebook PC with legacy USB ports to operate as a Type-C USB host.

Figure 3-2: CCG EVK Base Board Block Diagram
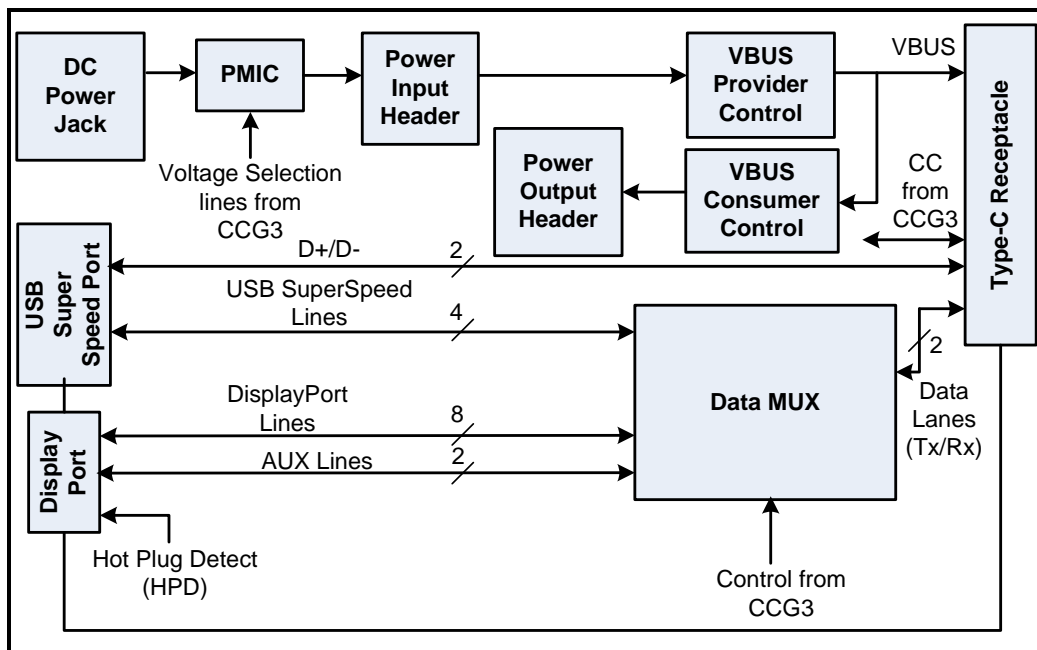
3.1.2 Features

Table 3-1 shows the features of the CCG EVK base board.

Table 3-1: CCG EVK Base Board Features

Feature	Description
Power	Negotiated power from the DC power adapter controlled by PMIC and CCG3. 5 V from the Type-C connector (for dead battery support). **Note:** The DC power adapter provided with the kit can support only up to 2.7A (at 24 V). This kit will not work with 5-V DC power adapters.
CCG3 Daughter Card Interface Connector	Provides interface to connect the CCG3 daughter card to the CCG EVK base board
Type-C Plug orientation, Detection and Alternate modes	I2C interface between the CCG3 device and a display multiplexer to select between SuperSpeed USB and 2-lane/4-lane DisplayPort
	Hot Plug Detect (HPD) for Display Port Alternate Mode of operation

3.1.3 Connectors and Jumper Settings

Figure 3-3 shows the CCG EVK base board connectors and default settings of the jumpers. Table 3-2 contains the detailed description of the connectors and jumper settings.

Figure 3-3: CCG EVK Base Board Connectors
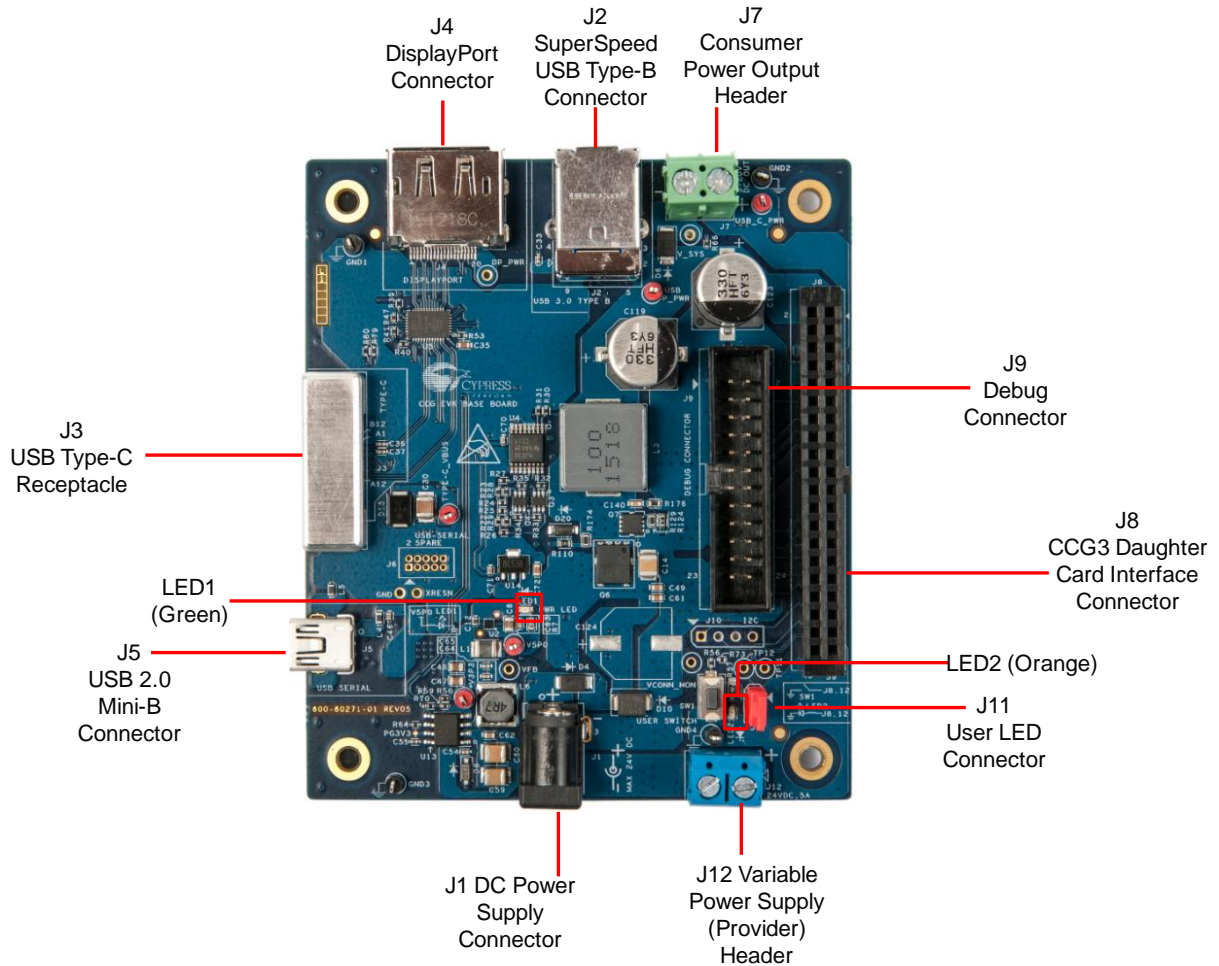
Table 3-2: CCG EVK Base Board Connector/Jumper Description

Connector/Jumper	Description	Default
J1	DC power jack to connect the DC power adapter to the CCG base board	NA
J2	SuperSpeed USB Type-B connector (receptacle)	NA
J3	USB Type-C Connector (receptacle)	NA
J4	DisplayPort Connector	NA
J5	USB 2.0 Mini-B Connector (Receptacle)	NA
J6	USB Serial Debug Header	This connector is not populated
J7	Header for voltage measurement when CCG3 acts as a power consumer or power output header	NA
J8	**CCG3 Daughter Card Interface Connector** Pin 1,2: Regulated input power from 24-VDC terminal (J12) of CCG EVK Base Board (USB_P_PWR)	NA

Connector/Jumper	Description		Default
	Pin 3,4: Power from VBUS of Type-C Connector (Type-C_VBUS)		
	Pin 5,6: Regulated output power to 20-Vdc terminal (J7) from USB_C_PWR pin of CCG3 daughter card		
	Pin 7: GND	Pin 8: GND	
	Pin 9: I2C_SCL	Pin 10: VBUS_DISCHRG	
	Pin 11: I2C_SDA	Pin 12: CCGx SWDIO	
	Pin 13: Over Current Protection Pin	Pin 14: CCGx SWD_CLK	
	Pin 15: AC_Adapter_Detect	Pin 16: CCGx XRES	
	Pin 17: VSEL2	Pin 18: I2C_ADDR0	
	Pin 19: 5 V	Pin 20: VCONN Monitor	
	Pin 21: CC1	Pin 22: CC2	
	Pin 23: 3.3 V	Pin 24: VBUS_P_CTRL	
	Pin 25: RXD	Pin 26: VBUS Monitor	
	Pin 27: TXD	Pin 28: I2C_INT_EC	
	Pin 29: MUX_DP_AUXN	Pin 30: VBUS_C_CTRL	
	Pin 31: MUX_DP_AUXP	Pin 32: Over Voltage Protection Pin	
	Pin 33: SBU2	Pin 34: I2C_SDA_EC	
	Pin 35: SBU1	Pin 36: Hotplug Detect	
	Pin 37: I2C_SCL_EC	Pin 38: TP12	
	Pin 39: VSEL1	Pin 40: TP11	
J9	**Debug Connector**		NA
	Pin 1,2: Power from VBUS of Type-C Connector (Type-C_VBUS)		
	Pin 3: CCGx SWDIO	Pin 4: CCGx XRES	
	Pin 5: CCGx CC1	Pin 6: CCGx CC2	
	Pin 7: I2C_SCL_EC	Pin 8: I2C_SDA_EC	
	Pin 9: I2C_INT_EC	Pin 10: Hotplug Detect	
	Pin 11: I2C_SCL	Pin 12: SW1/I2C_SDA	
	Pin 13: SW2	Pin 14: Over Current Protection Pin	
	Pin 15: CCGx SWD_CLK	Pin 16: Over Voltage Protection Pin	
	Pin 17: VSEL1	Pin 18: VSEL2	
	Pin 19: VBUS_P_CTRL	Pin 20: VBUS_DISCHRG	
	Pin 21: VBUS_Monitor GPIO	Pin 22: VBUS_C_CTRL	
	Pin 23: GND	Pin 24: GND	
J10	**I2C Connector**		This connector is not populated
	Pin 1: I2C_SDA_EC	Pin 2: I2C_SCL_EC	
	Pin 3: I2C_INT_EC	Pin 4: GND	
J11	User LED jumper for connecting LED to GPIO Pin 1: SWD_IO Pin 2: LED		Shorted
J12	Header for voltage measurement when CCG3 acts as a power provider or power input header.		NA

3.2 CY4531 CCG3 Daughter Card

The CCG3 daughter card is equipped with the CYPD3125-40LQXIT of the CCG3 device family and a CY7C65215-32LTXI USB-Serial Bridge Controller to provide a USB interface for debugging and programming. This CCG3 daughter card, when assembled with the CCG base board supports Type-C host applications such as note books and tablets.

3.2.1 Block Diagram

Figure 3-4 shows the CCG3 daughter card block diagram.

Figure 3-4 CCG3 Daughter Card Block Diagram
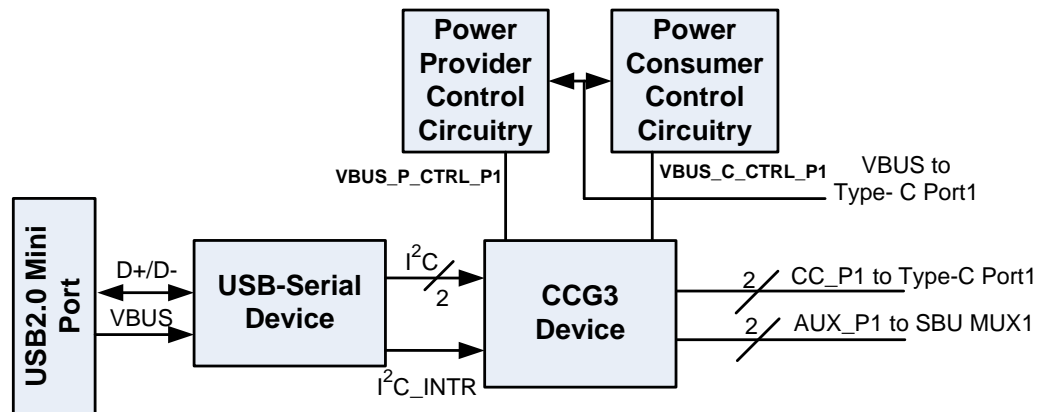
3.2.2 Features

Table 3-3 lists the features of the CCG3 daughter card.

Table 3-3: CCG3 Daughter Card Features

Feature	Description
CCG3 part number	CYPD3125-40LQXIT
CCG3 package	40-pin QFN
USB PD/ Type-C	Ability to support DRP, DFP, and UFP
	Type-C VBUS current setting via a jumper that selects one of the three Rp values. These three values correspond to the three currents as defined in the Type-C specification.
	VBUS provider field-effect transistor (FET) control for cold socket
	VBUS consumer FET control
	VBUS discharge FET control
	Ability to present either Rd or Rp on CC line
	Dead battery support
OVP and OCP	VCONN or VBUS over-current protection
	VBUS over-voltage protection
Plug orientation, Detection and Alternate modes	Five MUX-select pins to select between SuperSpeed USB and 2-lane or 4-lane DisplayPort
	Hot Plug Detect (HPD) for DisplayPort Alternate Mode of operation
USB 2.0 Type-B Mini	USB 2.0 Mini-B receptacle connected to USB-to-Serial device
I^{2}C interface	I^{2}C pins and interrupt output pin for connecting to an Embedded Controller (EC)
Programming	SWD pins to debug/program CCG3 using Cypress MiniProg3

Feature	Description
Power	5 V from USB 2.0 Mini (Connector J7 of CCG3 daughter card)
	5 V from MiniProg3 (Connector J1 of CCG3 daughter card)
	5 V to 20 V from Type-C connector (Connector J3 of CCG base board)
	24V DC from DC Power Supply Connector (Connector J1 of CCG base board)

3.2.3 Connectors and Jumper Settings

Figure 3-5 shows the CCG3 daughter card connectors and default settings of the jumpers. Table 3-4 contains the detailed description of the connectors and jumper settings.

Figure 3-5: CCG3 Daughter Card Connectors/Jumper Settings
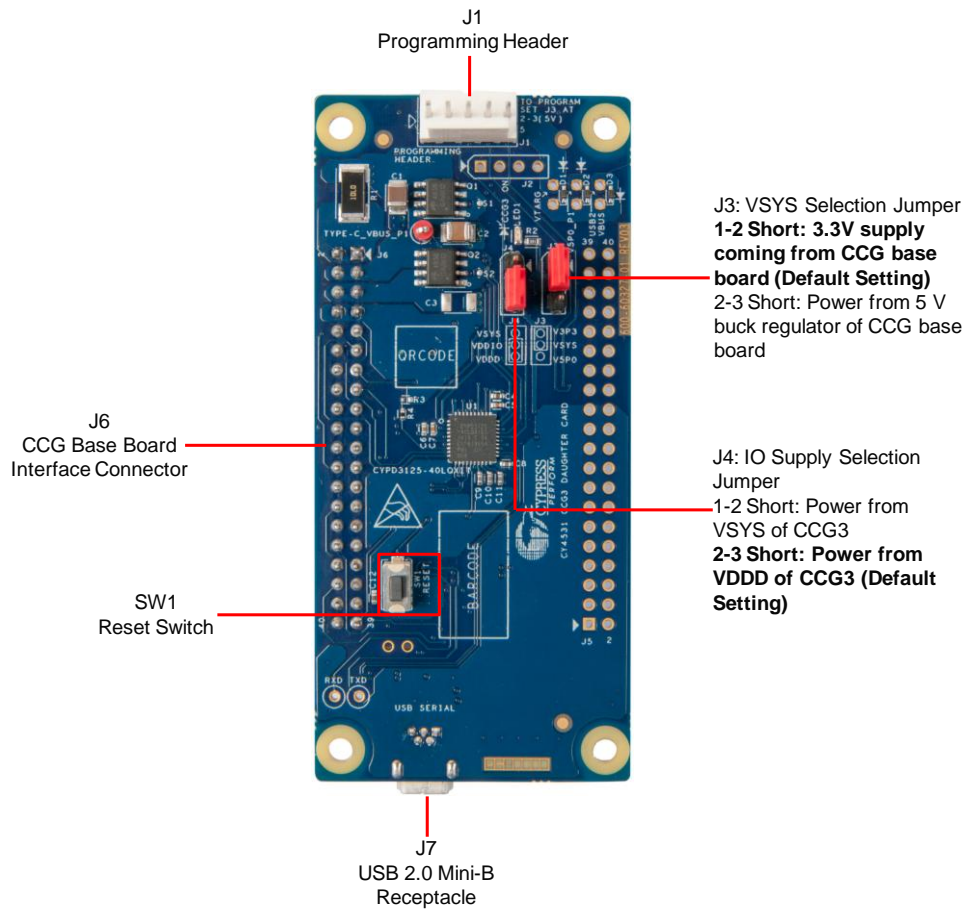
Table 3-4: CCG3 Daughter Card Connector/Jumper Description

Connector/Jumper	Description	Default
J1	Programming header Pin 1: VTARG Pin 2: GND Pin3: CCG3_XRES Pin4: CCG3_SWD_CLK Pin5: CCG3_SWD_IO	NA
J2	Debug header connected to gate driver pins of the CCG3 device	This connector is

Connector/Jumper	Description		Default
	Pin 1: NC	Pin 2: VBUS_P_CTRL1	not populated
	Pin 3: VBUS_C_CTRL1	Pin 4: GND	
J3	VSYS selection jumper: 1 and 2 short: Select the power from 3.3-V supply coming from the CCG base board 2 and 3 short: Select the power from 5-V buck regulator of the CCG base board		1 and 2 short
J4	I/O supply selection jumper: 1 and 2 short: Select the power from VSYS of CCG3 device 2 and 3 short: Select the power from VDDD of CCG3 device		2 and 3 short
J5	Spare 40-pin connector		This connector is not populated
J6	**CCGx Base Board Interface Connector**		NA
	Pin 1,2: Regulated input power from 24-VDC terminal (J12) of the CCG EVK Base Board (USB_P_PWR_P1)		
	Pin 3,4: Power from VBUS of Type-C Connector of the CCG EVK Base Board (TYPE-C_VBUS_P1)		
	Pin 5,6: Regulated output power to 20-VDC terminal (J7) of the CCG EVK Base Board (USB_C_PWR_P1)		
	Pin 7: GND	Pin 8: GND	
	Pin 9: I2C_SCL	Pin 10: VBUS_DISCHRG_P1	
	Pin 11: I2C_SDA	Pin 12: SWDIO	
	Pin 13: USB Provider Power Sense Pin	Pin 14: SWD_CLK	
	Pin 15: AC_Adaptor_Detect	Pin 16: XRES	
	Pin 17: VSEL2	Pin 18: UART2_RX	
	Pin 19: 5 V	Pin 20: UART2_TX	
	Pin 21: CC1	Pin 22: CC2	
	Pin 23: 3.3 V	Pin 24: VBUS_P_CTRL0	
	Pin 25: TXD	Pin 26: VCONN	
	Pin 27: RXD	Pin 28: I2C_INT_EC	
	Pin 29: DP_AUXN_P1	Pin 30: VBUS_C_CTRL0	
	Pin 31: DP_AUXP_P1	Pin 32: GPIO/P2.4	
	Pin 33: SBU2	Pin 34: I2C_SDA_EC	
	Pin 35: SBU1	Pin 36: Hotplug Detect	
	Pin 37: I2C_SCL_EC	Pin 38: DPlus	
	Pin 39: VSEL1	Pin 40: DMinus	
J7	USB 2.0 Mini-B connector (receptacle) Connected to USB-Serial device and used for programming CCG3 device		NA

3.3 Powering the CY4531 EZ-PD CCG3 EVK Setup

The CY4531 EZ-PD CCG3 EVK can be powered by connecting the 24-V DC power adapter to connector J1 of the CCG EVK base board. LED1 on both the boards glow green and LED2 on the base board blinks orange continuously, to indicate a successful power connection. The CY4531 EZ-PD CCG3 EVK can also be powered by connecting 24-V DC from a variable power supply to the terminals of connector J12 of the CCG base board.

Note: Check the jumper positions before you power the board. See Figure 3-3 and Figure 3-5 for default jumper settings of the CCG EVK base board and CCG3 daughter card.

4. Programming the CCG3 Device on CY4531 CCG3 EVK

The CCG3 device in the CY4531 CCG3 EVK is pre-programmed with the latest cyacd firmware binary image at the time of manufacturing. However, a newer *.cyacd* file may be available on the CY4531 CCG3 EVK webpage and in the CY4531 CCG3 EVK installer. The firmware version of the onboard CCG3 device can be verified by using the EZ-PD Configuration Utility as shown in Figure 4-4. If the onboard CCG3 device's firmware version does not match with the latest version on the CY4531 CCG3 EVK webpage, follow the steps in this chapter to reprogram the CCG3 device. This firmware update is necessary for successful kit operation.

The EZ-PD Configuration Utility (installed as a part of CY4531 EZ-PD CCG3 EVK Kit Software Installation) can be used to make minor updates to the configuration table of the CCG3 device (for example, changing PDOs and Vendor ID changes). Refer to the EZ-PD Configuration Utility User Manual for more details. For making application specific modifications, users can use the EZ-PD CCGx Software Development Kit (SDK) (Version 2.2 or later).

The CCGx Software Development Kit (SDK) (version 2.2 or later) along with PSoC® Creator™ (version 3.3 SP2 or later) allows users to harness the capabilities of Cypress's CCG families of Type-C Controllers. It provides a Type-C and USB-PD specification compliant firmware stack along with the necessary drivers and software interfaces required to implement applications using CCG controllers. The CCGx SDK also includes reference projects implementing standard Type-C applications and documentation that guides users in customizing existing applications, or creating new ones. For more information on the CCGx SDK, refer to the CCGx SDK User Guide. Click here to go to the CCGx SDK webpage and download and install the latest version.

4.1 Programming the CCG3 Device on the CCG3 Daughter Card

The EZ-PD Configuration Utility is a Microsoft Windows Application, which can be used to configure and program the CCG3 device on the CCG3 daughter card. The steps to update the firmware running on the CCG3 device of the CCG3 daughter card are as follows:

1. Download and install the latest kit software setup file "CY4531 EZ-PD CCG3 EVK Complete Setup" from the kit's website: www.cypress.com/CY4531. This installs the EZ-PD Configuration Utility as well.

2. Ensure that the voltage selection jumper (J3) is set to 5 V (pins 2 and 3 of jumper J3 on the CCG3 daughter card are shorted). Also, ensure that the I/O supply selection jumper (J4) is set to VDDD of the CCG3 device (pins 2 and 3 of jumper J4 on the CCG3 daughter card are shorted).

3. Connect the USB Type-A to Mini-B cable from host PC to CCG3 daughter card as shown in Figure 4-1.

Figure 4-1: Programming CCG3 Device on CY4531 CCG3 EVK

J7 (USB 2.0 recepatcle) on CCG3 daughter card

USB

USB Type-A to mini B Cable connected to J7 (USB 2.0 receptacle) on CCG3 daughter card
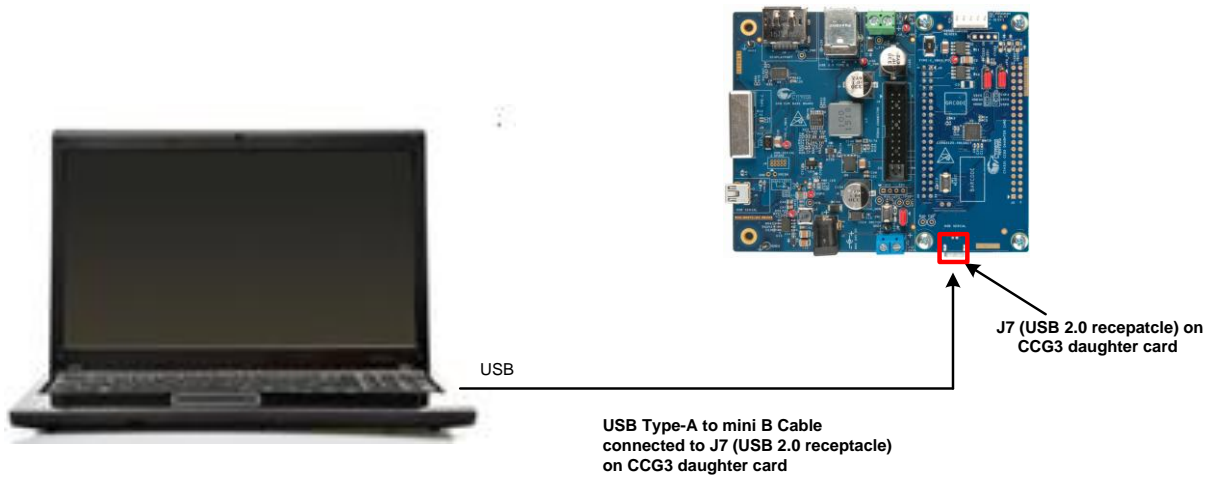
4. Launch the EZ-PD Configuration Utility as shown in Figure 4-2. After the installation, the EZ-PD Configuration Utility is available at the following location by default:

```
Windows > Start > All Programs > Cypress > EZ-PD Configuration Utility > EZ-PD
Configuration Utility
```

Figure 4-2: EZ-PD Configuration Utility
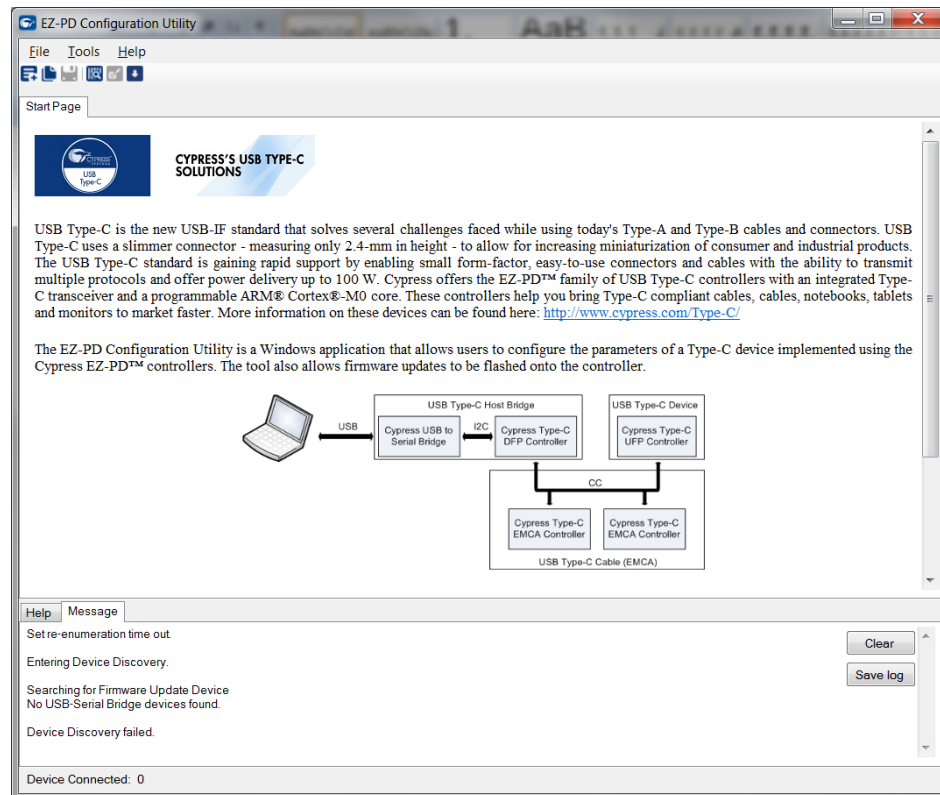
5. Select **Tools** > **Firmware Update** to update the firmware of the CCG3 device as shown in Figure 4-3. Refer to the EZ-PD Configuration Utility User Manual for more details. This document can also be opened by clicking **Help > User Manual** in the EZ-PD Configuration Utility.

Figure 4-3: Upgrading CCG3 Firmware
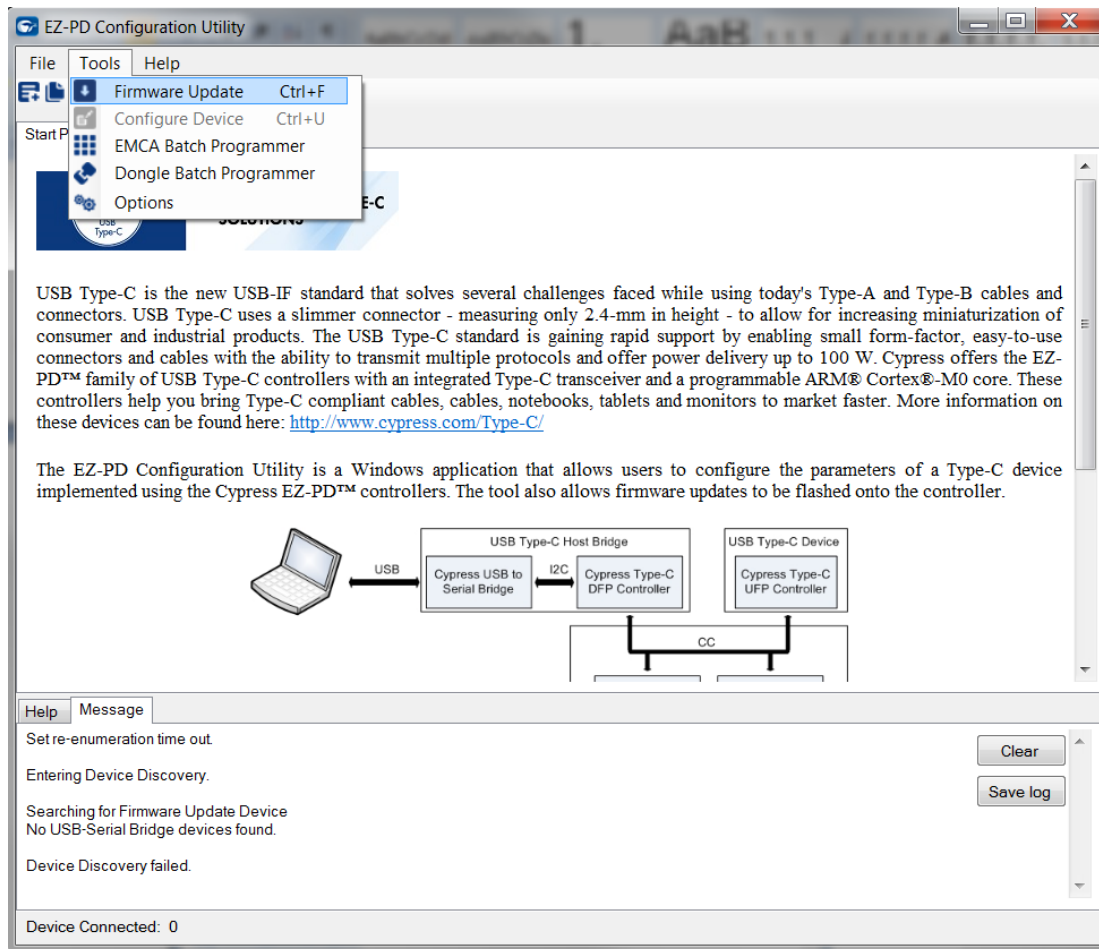
6. CCG3's internal device flash contains two copies of firmware that can mutually update each other. These copies are called FW1 and FW2, and are designed to be placed at different flash locations.

   If the CCG3 device is currently running FW1, only FW2 can be updated and vice-versa. The user can specify one or both firmware binaries in the **Firmware Update** window shown in Figure 4-4 and the appropriate firmware binary will be used for the update operation. If the device is currently running FW1, the utility will select the FW2 binary file from the two file locations provided and update FW2 during the process. If no FW2 path is provided by the user, then an error will be reported.

   It is possible to update both FW1 and FW2 binaries simultaneously by using the "**Bootloader Flashing**" option shown in Figure 4-4. In this case, the CCG device enters bootloader mode and updates both firmware banks. Depending on the status of the CCG3 device and the chosen selections, the ways the firmware update operation can be run can vary. Table 4-1 shows the possible firmware update options based on the CCG3 device status and user selection.

   After a firmware update process is complete and the CCG3 device is reset, the running firmware automatically switches to the most recently updated firmware.

Table 4-1. Possible "Firmware Update" options based on CCG3 device status and user selection

No.	Firmware Status	Firmware Update with "Bootloader Flashing" unchecked	Firmware Update with "Bootloader Flashing" checked
1	FW1 and FW2 Invalid	Can update FW1, FW2 or both*	Can update FW1, FW2 or both*
2	Only FW1 valid	Can update FW2 only	
3	Only FW2 valid	Can update FW1 only	
4	FW1 and FW2 valid, currently running FW1	Can update FW2 only	
5	FW1 and FW2 valid, currently running FW2	Can update FW1 only	

* **Note**: Firmware will be updated for the bank/s a valid file path is provided.

7. Download the latest firmware images from the CY4531 CCG3 EVK webpage. The CCG3 device firmware is provided in *.cyacd* format. Sample firmware binaries for each application and standard part numbers are provided on the CY4531 CCG3 EVK webpage. The firmware images are also available at the following location after the CY4531 CCG3 EVK installation: `<Install_Directory>\CY4531 CCG3 EVK\1.0\Firmware`

8. Select **NOTEBOOK** from the **Select target** list shown in Figure 4-4. Click **Browse (…)** in the **Firmware path 1** widget and select the FW1 image (CYPD3125-40LQXI_notebook_**one**_1_0_3_xxx*_0_0_0_nb.cyacd). Click **Browse (…)** in the **Firmware path 2** widget and select the FW2 image (CYPD3125-40LQXI_notebook_**two**_1_0_3_xxx*_0_0_0_nb.cyacd). Enable the **Bootloader Flashing** option by clicking on it. Click **Program**.
    Note*: Here, xxx refers to the firmware version.

Figure 4-4: Updating Firmware Using EZ-PD Configuration Utility
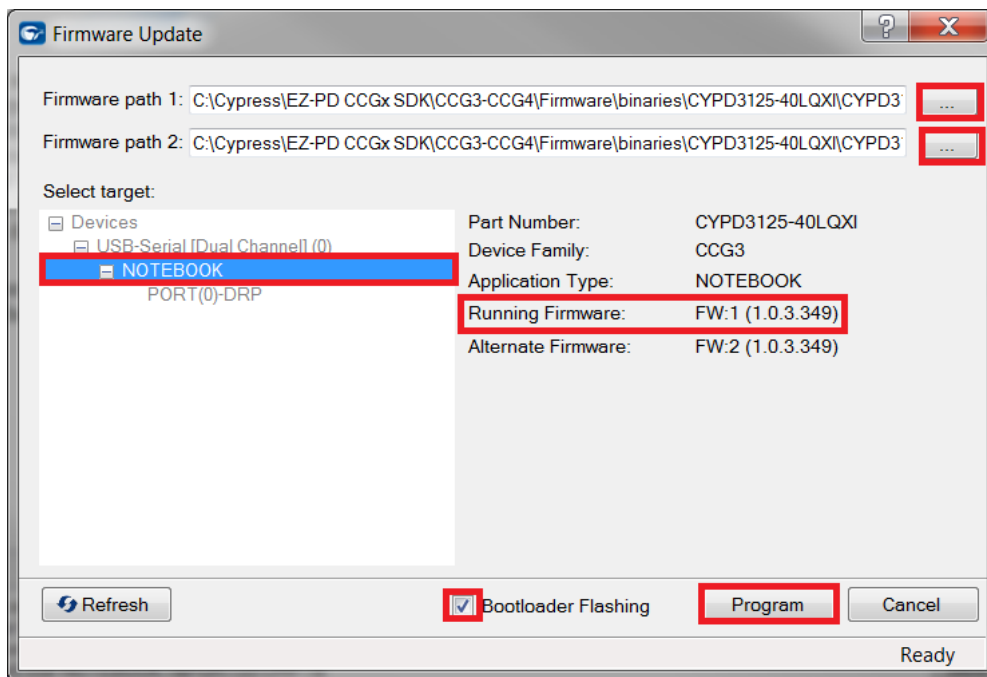
9. Upon clicking **Program**, the firmware update process is initiated over I^{2}C. The status bar at the bottom of the utility will show the progress; the Messages window will indicate the firmware update process. The old and new firmware versions are also displayed in the Messages window at the end of a successful firmware update.

10. Upon successful completion of the firmware update process, a window with the message "Firmware upgrade succeeded" is displayed as shown in Figure 4-5. Click **OK**.

Figure 4-5: Firmware Update Process Complete
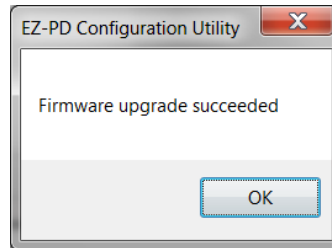
11. Press switch SW1 (XRES) on the CCG3 daughter card to reset the CCG3 device; the new firmware image will start executing.
12. CCG3 devices can also be programmed with a hex file (downloaded as a part of latest firmware images from the CY4531 CCG3 EVK webpage) using SWD header J1 on the CCG3 daughter card. Refer to the Knowledge Base Article for more details. A MiniProg3 device (not provided with the kit) is required to perform SWD programming. The MiniProg3 device can be purchased on the Cypress website (click here).

Warning: Do not disconnect the EVK from the PC while the firmware update is in progress.

5. Kit Operation

This chapter describes how to configure the CY4531 EZ-PD CCG3 EVK to demonstrate proper operation and functionality as a DRP device. Three separate demonstrations are covered.

- SuperSpeed USB Demo

- DisplayPort Demo

- Dead Battery Demo

The SuperSpeed USB demonstration provides details about connecting a host (PC) to a client (USB flash drive) through the CY4531 EZ-PD CCG3 EVK boards, also referred to as the "SuperSpeed USB Demo" in this kit guide. The DisplayPort demonstration provides details about connecting a host (PC) to a client (display monitor) through the CY4531 EZ-PD CCG3 EVK boards, also referred to as the "DisplayPort Demo" in this kit guide. The dead battery demonstration emulates a scenario of a notebook with dead battery, which can be charged by connecting the Type-C power adapter to its Type-C port.

5.1 SuperSpeed USB Demo

The SuperSpeed USB demo is a full end-to-end demo that demonstrates the following:

- Type-C connectivity between the DFP (host) and UFP (client)

- Reversibility of the Type-C cable.

5.1.1 Boards, Cables, and Accessories Needed

The following items are needed to perform this demo:

- Items provided with the kit

  o 24-V DC power adapter provided with the kit

  o CY4531 EZ-PD CCG3 EVK boards (base board and daughter card)

  o SuperSpeed USB Type-A to Type-B cable

  o USB Type-C to Type-A adapter board

- Items not provided with the kit

  o USB host device (example: PC)

  o USB flash or disc drive (not provided with the kit. It is recommended to use a SuperSpeed USB flash drive)

5.1.2 Running the SuperSpeed USB Demo

1. Use the default jumper settings shown in Figure 5-1 and Figure 5-2 to configure the CY4531 EZ-PD CCG3 EVK's base board and daughter card.

Figure 5-1: CCG EVK Base Board Jumper Settings for SuperSpeed USB Demo

J11
LED Jumper must
be loaded
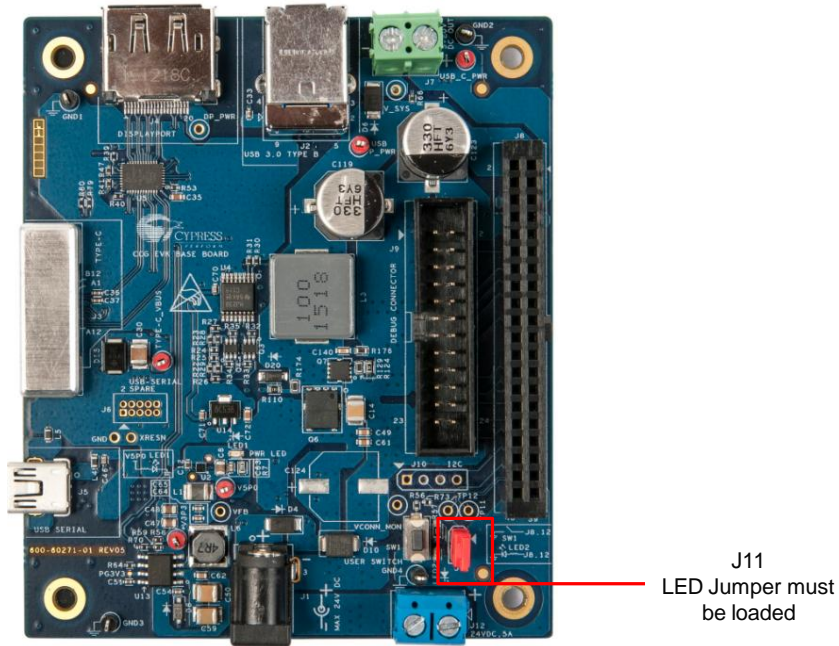
Figure 5-2: CCG3 Daughter Card Jumper Settings for SuperSpeed USB Demo
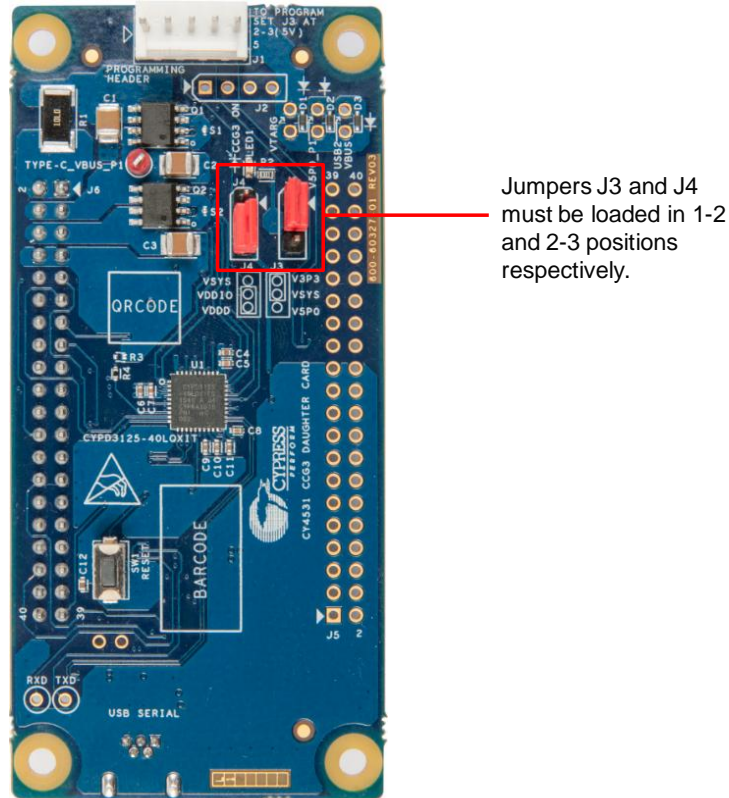
Jumpers J3 and J4
must be loaded in 1-2
and 2-3 positions
respectively.

2. Mount the CCG3 daughter card on the CCG base board of the CY4531 EZ-PD CCG3 EVK if not already mounted. Use the SuperSpeed USB Type-A to Type-B cable to connect the CCG base board to the PC.

3. Connect the 24-V DC power adapter provided with the kit to the CY4531 EZ-PD CCG3 EVK base board power jack J1. Observe LED1 on the CCG3 daughter card and CCG base board glow green to indicate power is ON, and LED2 on CCG base board blinks orange to indicate the CCG firmware is executing.

4. Connect the USB Type-C to Type-A adapter board provided with the CY4531 EZ-PD CCG3 EVK to the Type-C port (J3) of the CCG base board.

5. Plug in a USB drive (not provided with the kit) into the Type-C to Type-A adapter board. Verify your setup as shown in Figure 5-3. To evaluate SuperSpeed USB data transfers, it is recommended to use a SuperSpeed USB flash drive.

Figure 5-3: Setup of SuperSpeed USB Demo Using CY4531 EZ-PD CCG3 EVK
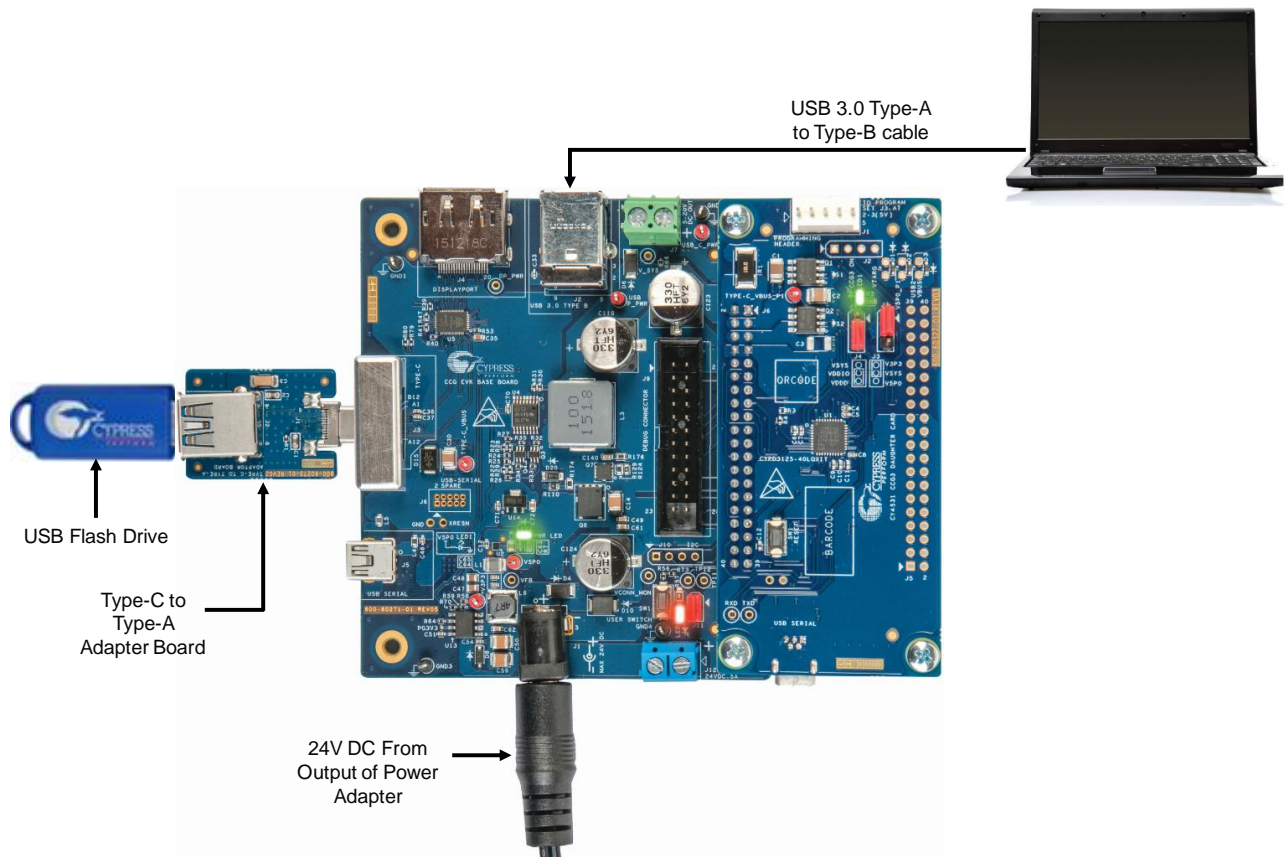
6. Observe the enumeration of the USB drive connected to the Type-C to Type-A adapter board on the host PC connected via the CY4531 EZ-PD CCG3 EVK's base board and daughter card. Verify functionality by accessing files on the connected USB drive from the PC.

7. Disconnect the Type-C to Type-A adapter board and connect it upside down to reconnect the SuperSpeed USB drive.

8. Observe the enumeration of the USB drive connected to the Type-C to Type-A adapter board on the PC connected via the CY4531 EZ-PD CCG3 EVK base board and daughter card even with the Type-C to Type-A adapter board flipped. Also observe the SuperSpeed USB data transfer speed by transferring files. This demonstrates orientation adjustment of the USB Type-C interface.

5.1.3 Explanation of Functionality

By flipping over the USB Type-C to Type-A adapter board and reconnecting to the setup, we reversed the order of the four channels from the original setup. This demonstrates functionality in a use case scenario where a Type-C cable is connected between the host and client with the ends reversed. The reverse order will not affect the enumeration process due to the reversible characteristics of Type-C cables.

5.1.4 Common Problems and Troubleshooting

If the demo is not functional, follow these guidelines to troubleshoot.

1. Ensure that the CY4531 EZ-PD CCG3 EVK's base board and daughter card are powered by verifying that LED1 on both boards is glowing green and LED2 on the CCG base board is blinking. If LED2 on the CCG base board does not blink, the CCG3 device is not active. Assert and release the reset button on the CCG3 daughter card (SW1).

2. Ensure that the CCG3 daughter card is mounted properly on the CCG base board; all connections between the two boards must be completely mated.

3. If the SuperSpeed USB device does not enumerate as expected on the PC, unplug the device and then plug it back in. It should enumerate as a SuperSpeed USB device this time.

5.2 DisplayPort Demo

The DisplayPort demo is a full end-to-end demo that demonstrates the following:

■ Type-C connectivity between the DFP (host) and UFP (client)

■ USB PD Alternate Mode (for DisplayPort): Delivers four-lane DisplayPort video from the host (PC) to client (display monitor).

5.2.1 Boards, Cables, and Accessories Needed

The following items are needed to perform this demo:

■ Items provided with the kit

   o 24-V DC power adapter provided with the kit

   o CY4531 EZ-PD CCG3 EVK base board and daughter card

■ Items not provided with the kit

   o DisplayPort video source (example: PC)

   o DisplayPort monitor

   o DisplayPort cable that connects the CCG base board to the PC. If the PC has a Mini DisplayPort plug, use the Mini DisplayPort to DisplayPort cable (see the List of Recommended Hardware section)

   o Type-C to DP/HDMI/VGA adapter connects the CY4531 EZ-PD CCG3 EVK to the display monitor through the relevant cable (see the List of Recommended Hardware section)

5.2.2 Running the DisplayPort Demo

1. Use the default jumper settings shown in Figure 5-1 and Figure 5-2 to configure the CY4531 EZ-PD CCG3 EVK's base board and daughter card.
2. Mount the CCG3 daughter card on the CCG base board of the CY4531 EZ-PD CCG3 EVK if not already mounted.

3. Connect the 24-V DC power adapter provided with the kit to the CY4531 EZ-PD CCG3 EVK base board power jack J1. Observe LED1 on the CCG3 daughter card and CCG base board glow green to indicate power is ON, and LED2 on the CCG base board blinks orange to indicate the CCG firmware is executing.

4. Connect the Type-C to DP/HDMI/VGA adapter to J3 USB Type-C receptacle of CCG base board. Connect its other end to a display monitor that supports the interface using a DisplayPort/HDMI/VGA cable.

5. Connect the DisplayPort video source i.e. PC to the CCG base board's DisplayPort connector J4.

6. After all connections, your set up should look similar to the setup shown in Figure 5-4.

Figure 5-4: Setup of DisplayPort Demo Using CY4531 EZ-PD CCG3 EVK
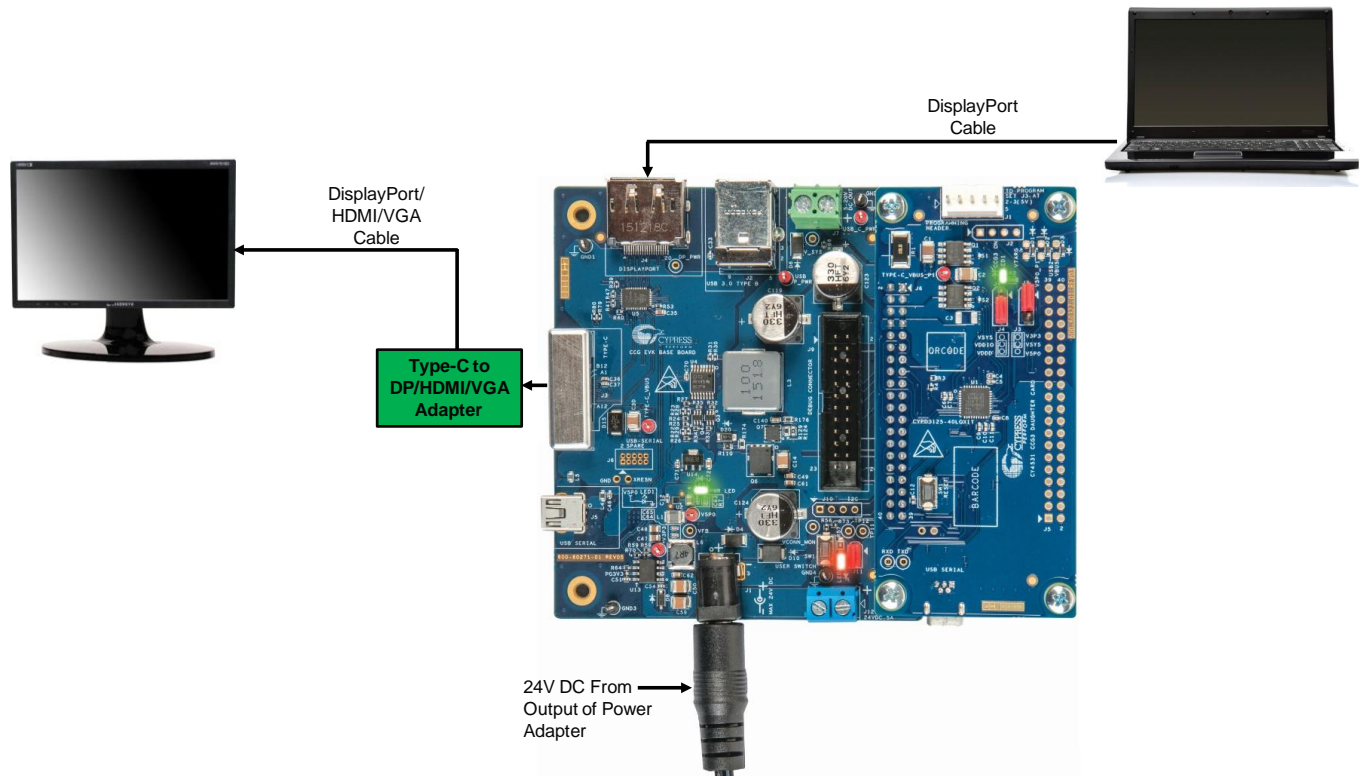
7. Ensure that the "Extended Display" feature is enabled in the host PC. For Windows users, this feature can be enabled by clicking **Extended Display**, available at "Control Panel\All Control Panel Items\Display\Connect to a Projector" window. For Linux or Mac users, this feature can be enabled by checking the **Mirror image** option, available at "System Preferences (or Settings)\Display".

8. Observe that the DisplayPort video is transferred from the host (PC) to the display monitor through the USB Type-C port.

5.2.3 Common Problems and Troubleshooting

If the demo is not functional, follow these guidelines to troubleshoot:

1. Ensure that the CY4531 EZ-PD CCG3 EVK's base board and daughter card are powered by verifying that LED1 on both boards is glowing green and LED2 on the CCG base board is blinking. If LED2 on CCG base board is not blinking, CCG3 device is not active. Assert and release the reset button on the CCG3 daughter card (SW1).

2. Ensure that these boards are powered before connecting the DisplayPort cables.

3. Ensure that the CCG3 daughter card is mounted properly on the CCG base board. All connections between the two boards must be completely mated.

4. Ensure that the "Extended Display" in enabled on the host PC.

5. If the PC video is not displayed on the monitor, assert and release the reset button on the CCG3 daughter card (SW1).

5.3 Dead Battery Demo

The Dead Battery demo demonstrates the following:

■ Emulates a scenario of a notebook with a dead battery, which can be charged by connecting a Type-C power adapter to its Type-C port.

■ Ability of the CCG3 device to perform the power role of a provider as well as a consumer.

5.3.1 Boards, Cables, and Accessories Needed

The following items are needed to perform this demo:

- Items provided with the kit

    o CY4531 EZ-PD CCG3 EVK base board and daughter card

- Items not provided with the kit

    o Type-C power adapter (see List of Recommended Hardware section)

    o Digital Multimeter to measure voltage

5.3.2 Running the Dead Battery Demo

1. Use the default jumper settings shown in Figure 5-1 and Figure 5-2 to configure the CY4531 EZ-PD CCG3 EVK's base board and daughter card.
2. Mount the CCG3 daughter card on the CCG base board of the CY4531 EZ-PD CCG3 EVK if not already mounted.
3. **Do not connect the 24V DC power adapter provided with the kit to the power jack J1 of the CCG base board. Connecting the DC adapter in this demonstration may damage the CY4531 EZ-PD CCG3 EVK boards.** This limitation is explained in detail in the Power Supply Connections section.
4. Because no power is connected to the EVK, the CCG3 device on the CCG3 daughter card is not powered, and thus emulates a dead battery scenario for a notebook. The CCG3 device in the EVK can be powered by connecting a Type-C power adapter to the Type-C port. As shown in Figure 5-5, connect a Type-C power adapter (not provided with the kit. See List of Recommended Hardware section) to Type-C port J3 of the CCG base board. LED1 on the CCG3 daughter card and CCG base board glow green to indicate power is ON, and LED2 on the CCG base board blinks orange to indicate the CCG firmware is executing.

Figure 5-5: Setup of Dead Battery Demo Using CY4531 EZ-PD CCG3 EVK
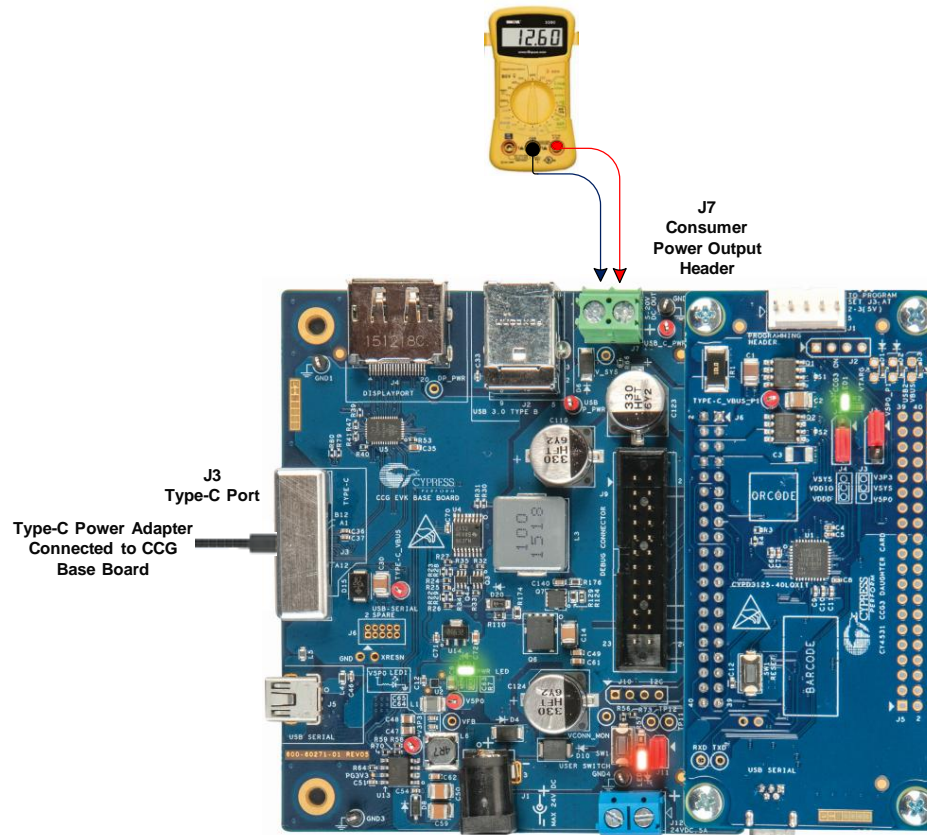
5. When the CCG3 device in the EVK is powered, it establishes a power contract with the Type-C power adapter and starts consuming power. This can be verified by connecting a digital multimeter to the consumer power output header (J7) of the CCG base board to measure the output voltage in the dead battery charging scenario. The output voltage at

the consumer power consumer header (J7) is based on the power negotiation between the CCG3 device and the Type-C power adapter. Thus, it will vary with respect to the attached Type-C power adapter. This demonstrates that a CCG3 enabled notebook with a Type-C port can be charged from the dead battery condition.

5.3.3 Power Supply Connections

A PC with a USB 3.0 port and a DisplayPort, along with the CY4531 EZ-PD CCG3 EVK, is equivalent to a PD-enabled Type-C port Notebook as shown in Figure 5-6. In a real Type-C Notebook design, power from the power output header (J7) of the CCG base board acting as the power adapter is connected to a Battery Charger Circuit (BCC) of a USB 3.0 Notebook/PC. On the CCG3 EVK, the DC power jack J1 on the CCG base board is provided for demonstration purposes only because the internal supply from the notebook is not available. In a real system, the DC power input header J12 of the CCG base board would be connected to the PMIC. A DC power adapter (if required, shown as "Notebook Power Adapter" block in Figure 5-6) would be connected to the "ORing Controller" block which supplies power to the Battery Charger Circuit.

Power being provided to the CCG3 kit would come from a PMIC in the Notebook, and the input source to that PMIC could be either the notebook battery, a DC power adapter or, a Type-C power adapter. Hence, in a Notebook, it is possible to connect both the DC power adapter and the Type-C power adapter without destroying the PC. However, in the case of the CY4531 EZ-PD CCG3 EVK, because the internal power points to the Notebook are inaccessible, it is mandatory that when the CY4531 EZ-PD CCG3 EVK is powered by a Type-C power adapter, power should not be provided via the power jack J1 of the CCG base board or else it may damage the EVK boards. This restriction is not due to a limitation on the CCG3 device, but only because of the inaccessibility of the internal power points inside a Notebook/PC.

Figure 5-6: Type-C Notebook Design Using CY4531 EZ-PD CCG3 EVK
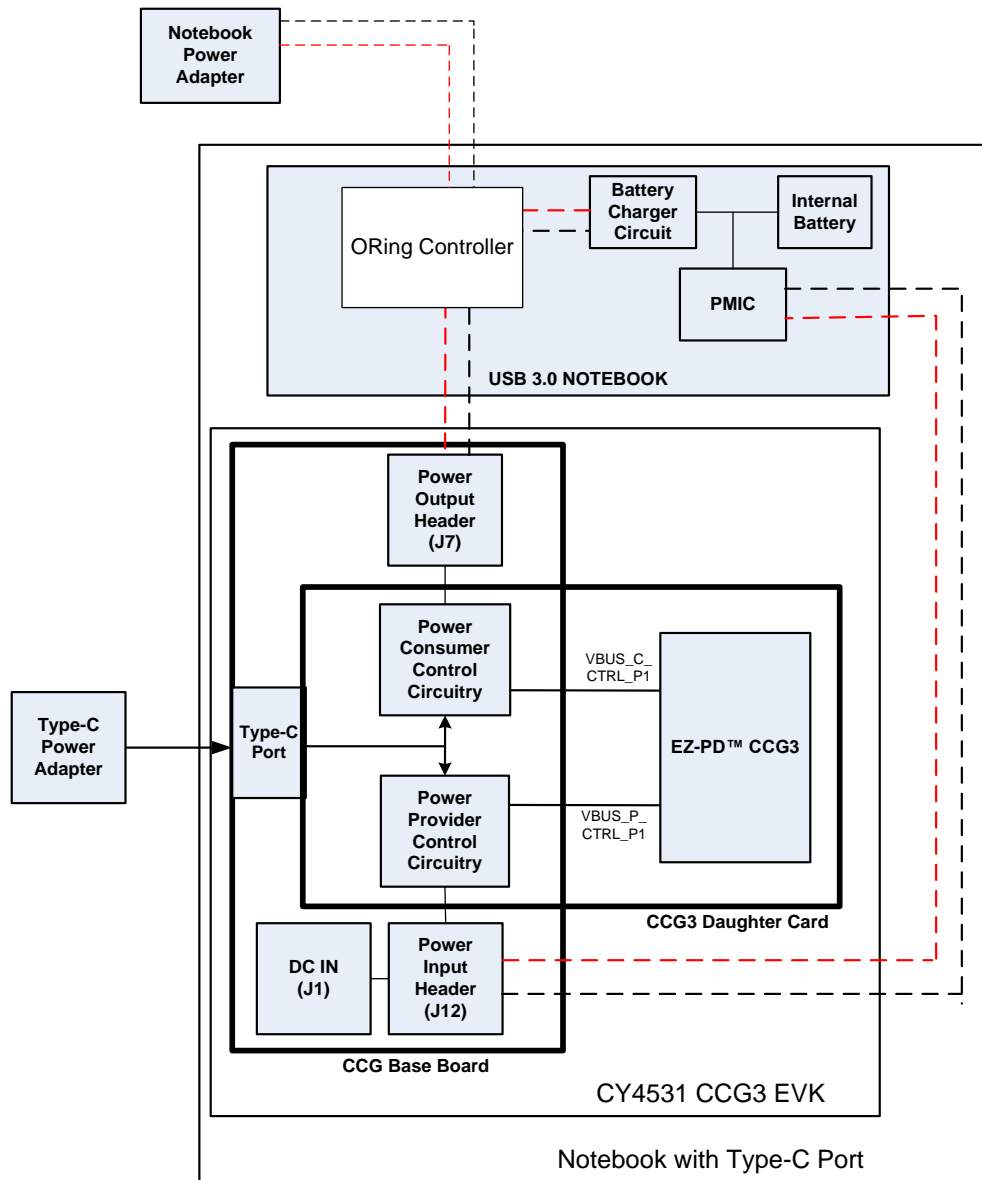
The CCG3 daughter card consists of both power provider and power consumer circuitry for the Type-C port. The CCG3 device controls this circuitry and decides the source of the power for the CCG base board and the CCG3 daughter card. The power input header on the CCG base board can receive DC power directly. The power output header on the CCG base board can receive and source power directly when a Type-C power adapter is connected to the Type-C port.

In a CY4531 EZ-PD CCG3 EVK enabled Type-C PC design, the entire EVK can be powered using the following methods:

Method 1: A DC power adapter is connected to the DC power jack (J1) on CCG base board. In this scenario, the CCG3 device turns on the power provider control circuitry and power is available on the power input headers.

Method 2: A Type-C power adapter is connected to the Type-C port. In this scenario, the CCG3 device turns on the power consumer control circuitry and power is available on the power output headers.

5.3.4 Common Problems and Troubleshooting

If the demo is not functional, follow these guidelines to troubleshoot:

1. Ensure that the CY4531 EZ-PD CCG3 EVK's base board and daughter card are powered by verifying that LED1 on both boards is glowing green and LED2 on the CCG base board is blinking. If LED2 on CCG base board is not blinking, CCG3 device is not active. Assert and release the reset button on the CCG3 daughter card (SW1).

2. Ensure that the CCG3 daughter card is mounted properly on the CCG base board. All connections between the two boards must be completely mated.

3. Ensure that the I/O Supply Selection jumper (J4) of the CCG3 daughter card is set to its default setting (2-3 short as shown in Figure 3-5).

4. If there is no voltage at jumper J7 of the CCG base board, verify the connection of the Type-C Power Adapter. Also ensure that the connected Type-C power adapter supports a 5V to 20V power profile.

6. Appendix

6.1 Terminology

This guide assumes that the user of the CCG3 board is familiar with the fundamentals of Type-C connectivity and the USB Power Delivery protocol. A brief description of Type-C terms is provided here for reference.

■ Alternate Modes: A feature of a USB Type-C system whereby one or both of the SuperSpeed lanes may be repurposed for use with a different serial protocol, such as a DisplayPort, eSATA, or Thunderbolt.

■ Client: A USB peripheral such as a hub, docking station, or monitor.

■ Configuration channel (CC): A USB Type-C bus wire used to transmit protocol signals. This is a half-duplex 300-kHz signal.

■ Consumer: A Type-C port that sinks power from VBUS.

■ DisplayPort: A digital display interface standard developed by the Video Electronics Standards Association. It is used primarily to connect a video source to a display such as a computer monitor.

■ Downstream facing port (DFP): A USB Type-C port on a host or a hub to which devices are connected.

■ Dp, Dn: USB Type-C bus wires used to transmit and receive USB 2.0 data.

■ Dual-role port (DRP): A USB Type-C port that can operate as either a DFP or a UFP.

■ Electronically Marked Cable Assembly (EMCA): A USB cable that includes an IC that reports cable characteristics (such as current rating) to the Type-C ports.

USB3.0 Type-C Plug

USB3.0 Type-C Receptacle
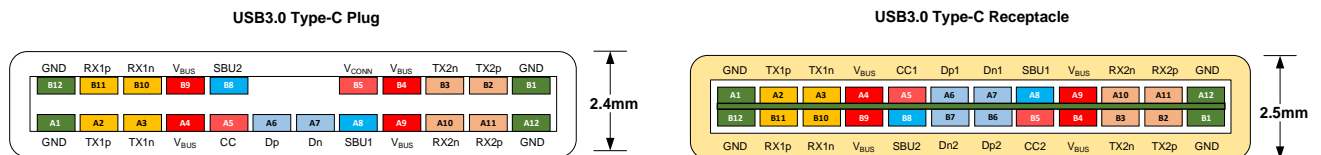
■ Host: A USB Host system such as a PC, notebook, and laptop.

■ Provider: A Type-C port that sources power over VBUS.

■ Sideband use (SBU): A USB Type-C bus wire used for non-USB control signals, such as DisplayPort control signals.

■ Type-C Transceiver: A transmitter/receiver that communicates over the CC.

■ TX1p, TX1n, RX1p, RX1n, TX2p, TX2n, RX2p, and RX2n: USB Type-C bus wires used to transmit and receive SuperSpeed USB and PCIe or DisplayPort data.

■ Upstream facing port (UFP): A USB Type-C port on a device or a hub that connects to a host or the DFP of a hub.

■ USB Power Delivery (USB PD, PD): A new USB standard that increases maximum power delivery over USB from 7.5 W to 100 W.

■ USB Type-C (Type-C): A new standard with a slimmer USB connector and a reversible cable, capable of sourcing up to 100 W of power and supporting Alternate Modes.

■ VBUS: A USB Type-C bus wire used for power; initially 5 V, but increased up to 20 V on USB PD systems.

■ VCONN: A USB Type-C bus wire used to power the IC in the EMCA.

6.2 CCG3 EVK Base Board

6.2.1 Schematics

CCG EVK BASE BOARD - 3.3V, 5V POWER
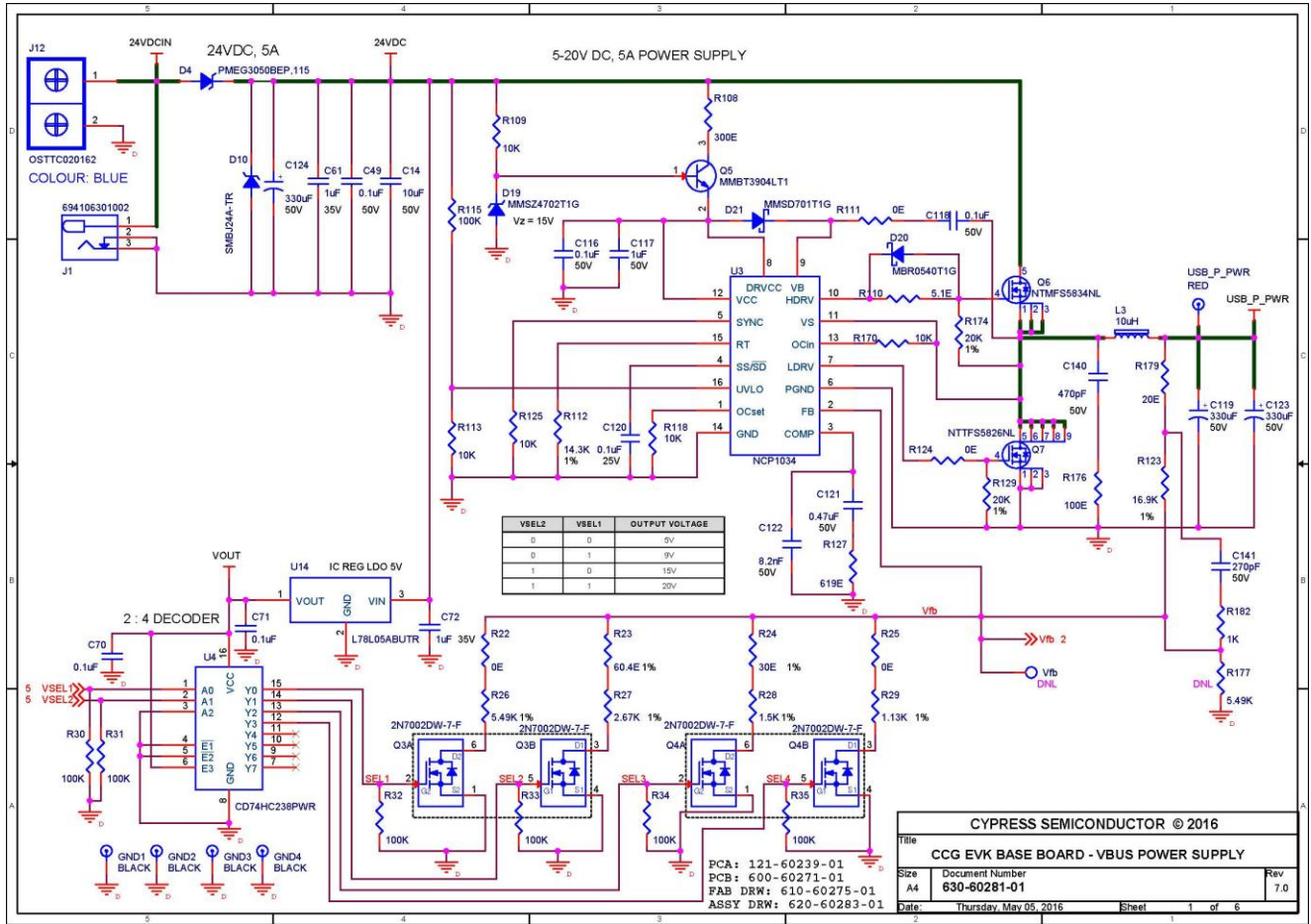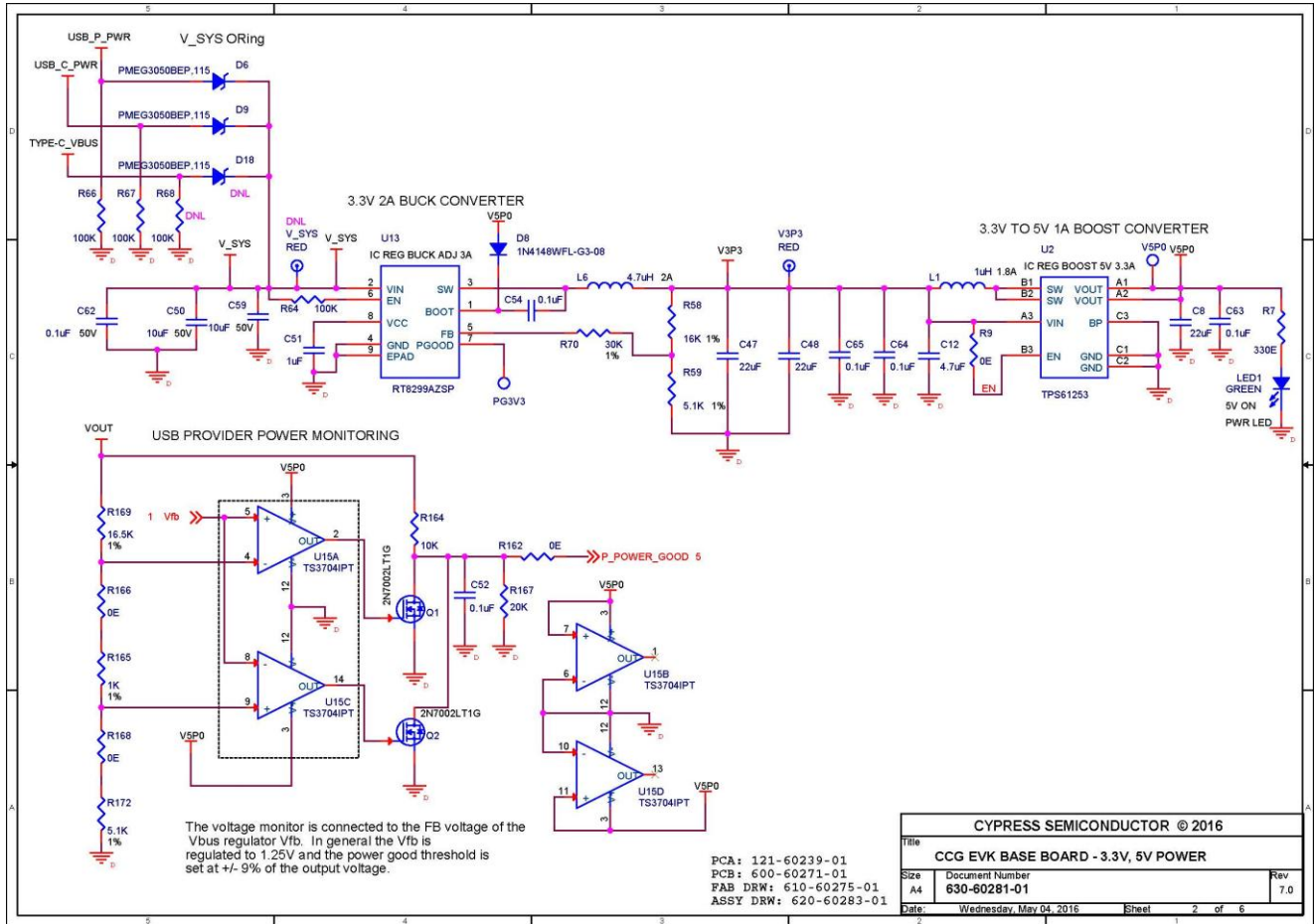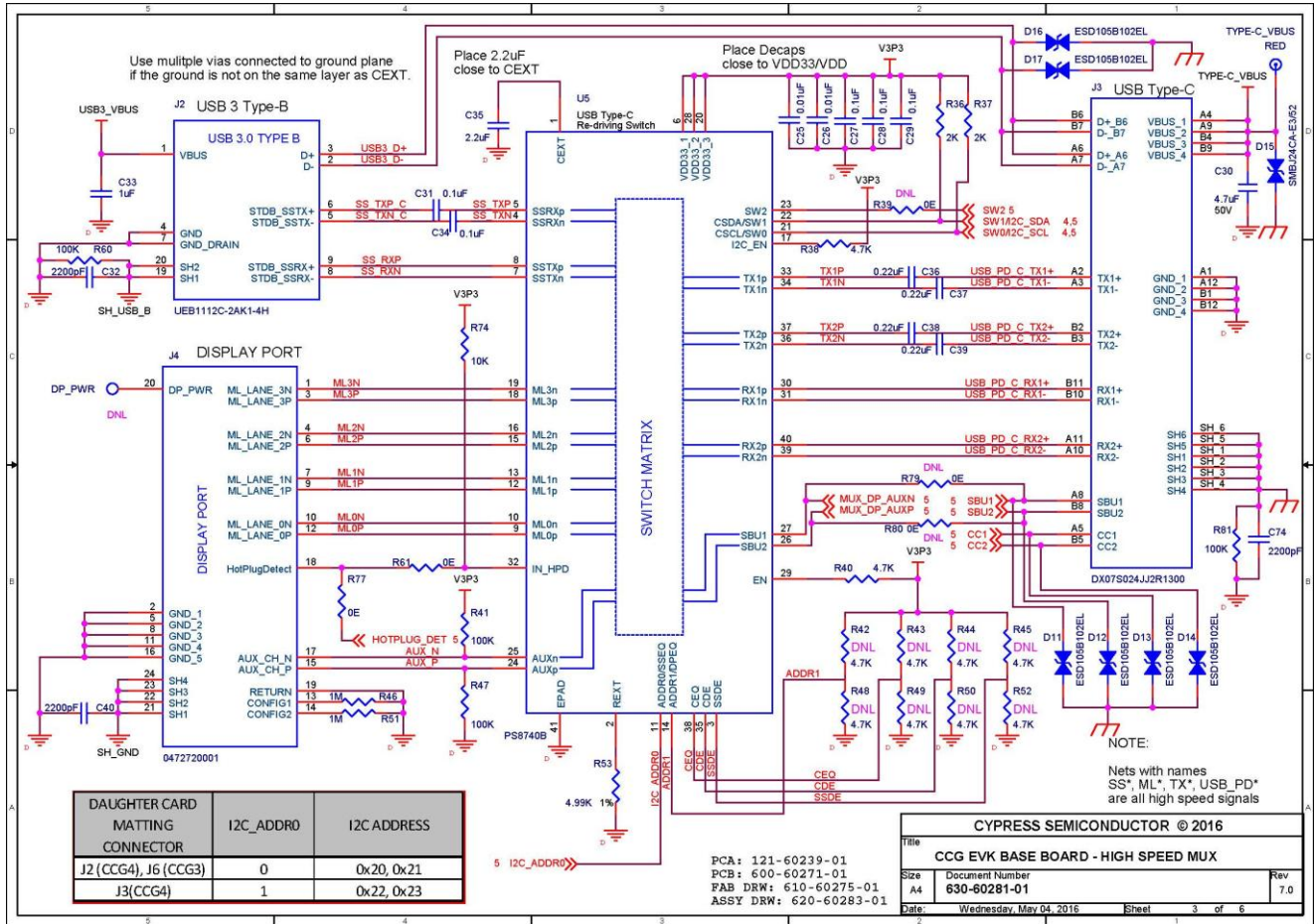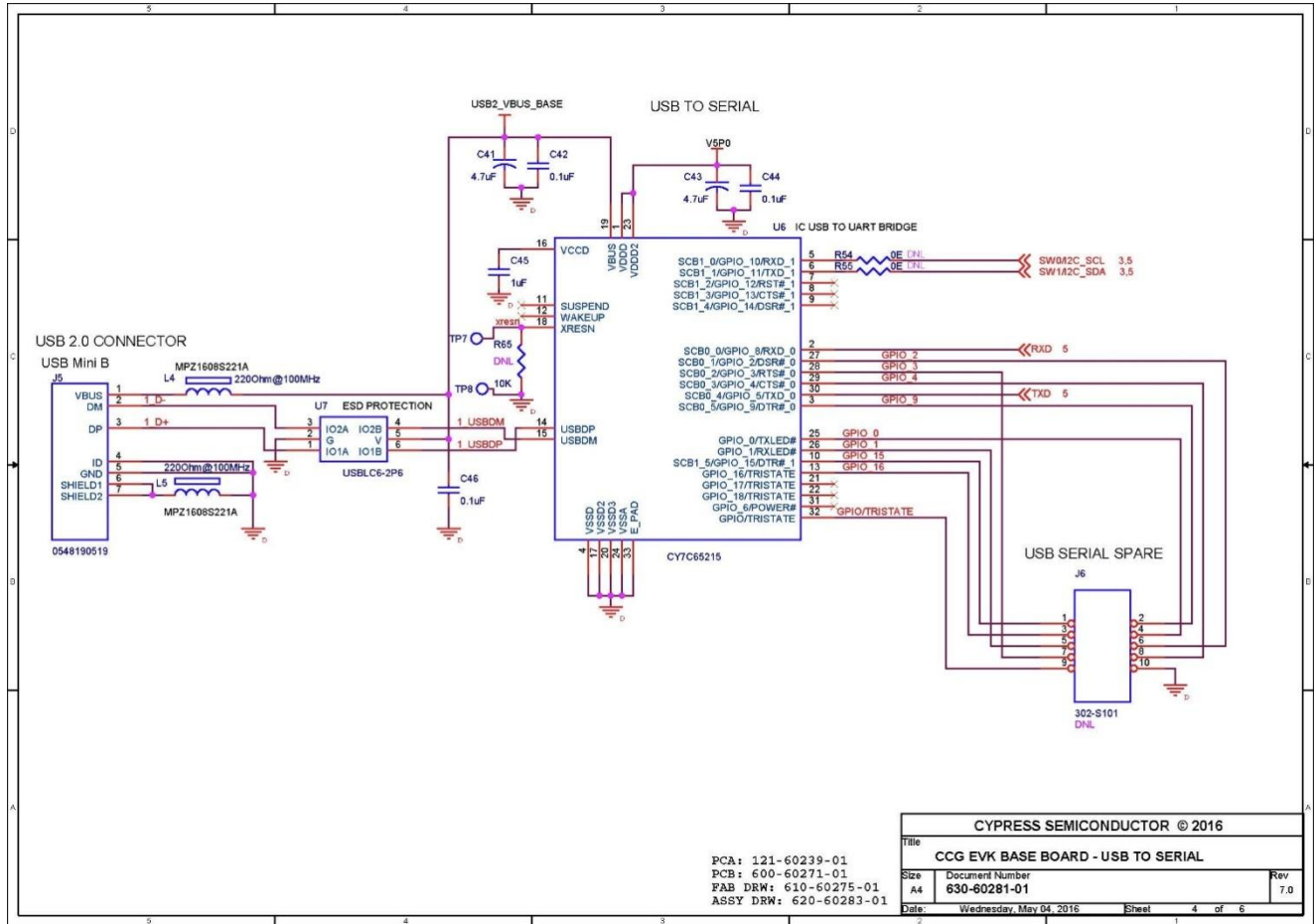
6.2.2 Gerber Files

600-60271-01 REV05 POWER1 LAYER

600-60271-01 REV05 POWER1 LAYER
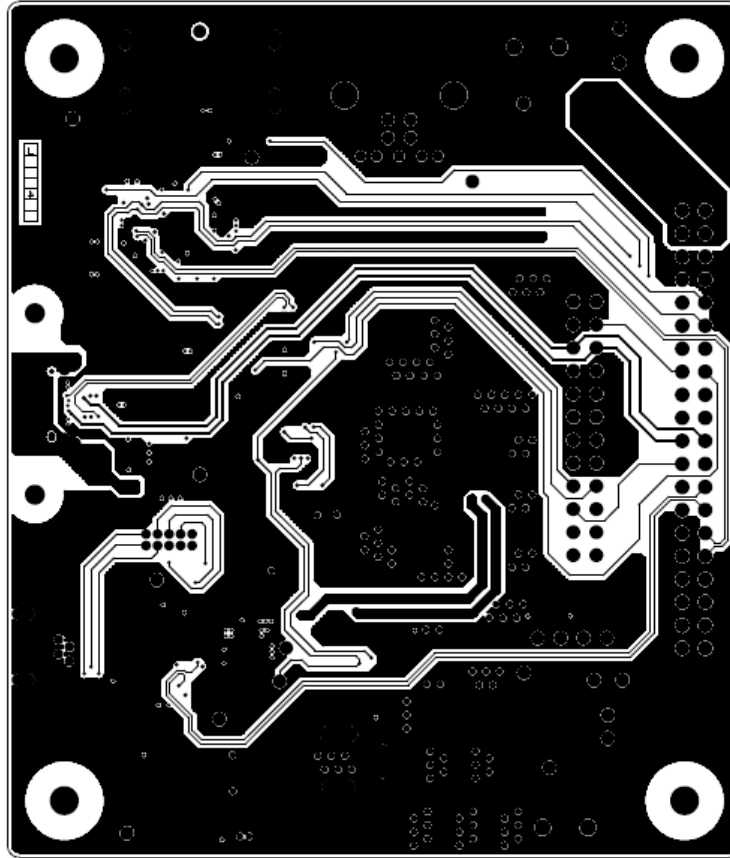
600-60271-01 REV05 SIGNAL1 LAYER
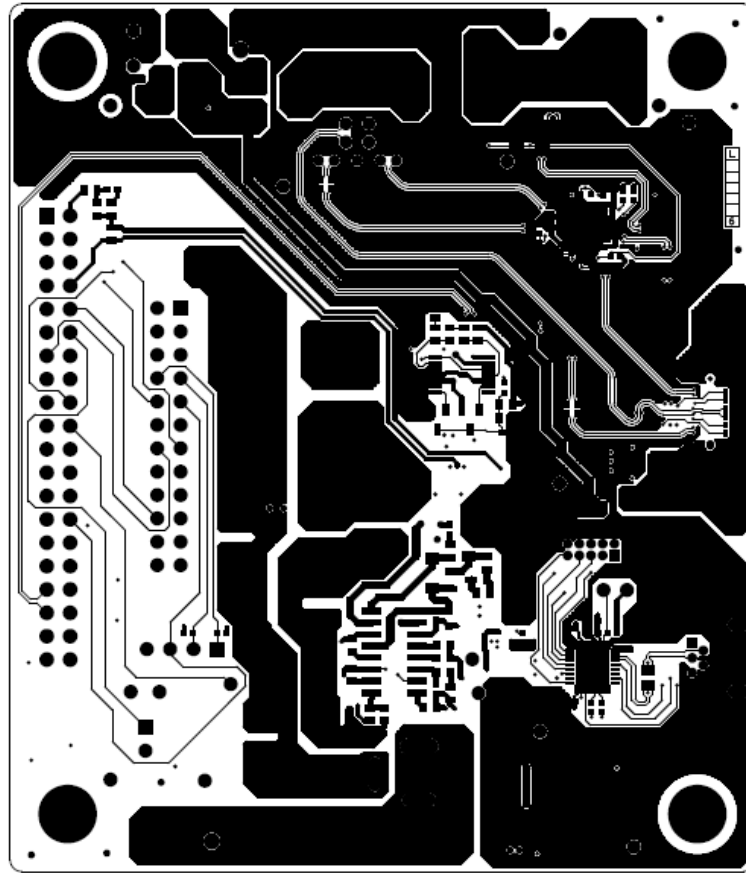
600-60271-01 REV05 SECONDARY SIDE
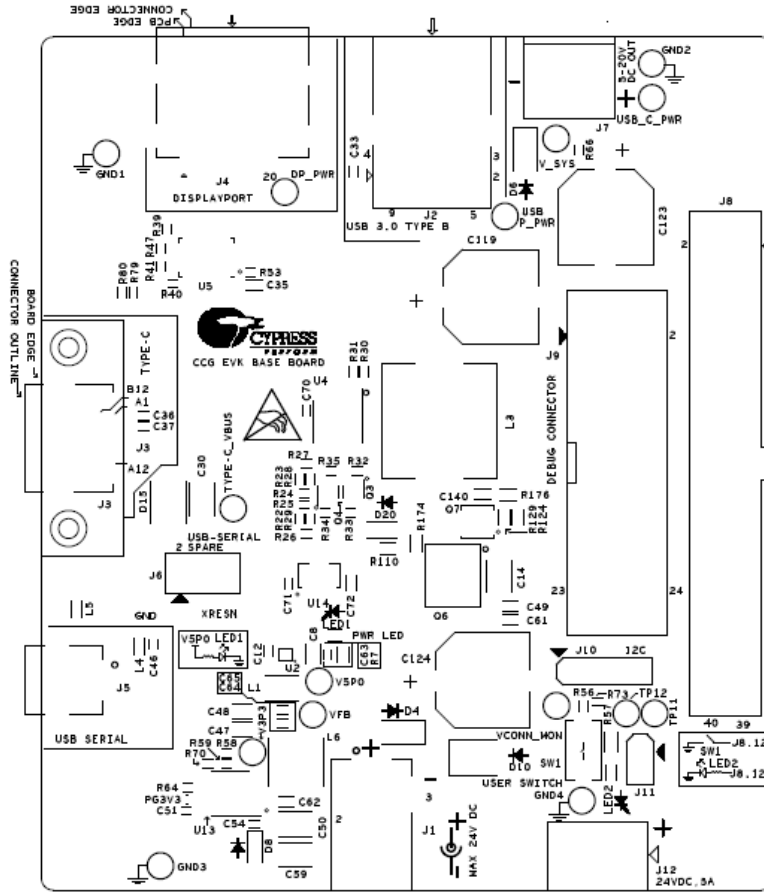
600-60271-01 REV05 PRIMARY SILKSCREEN

600-60271-01 REV05 SECONDARY SILKSCREEN

6.2.3 Bill of Materials

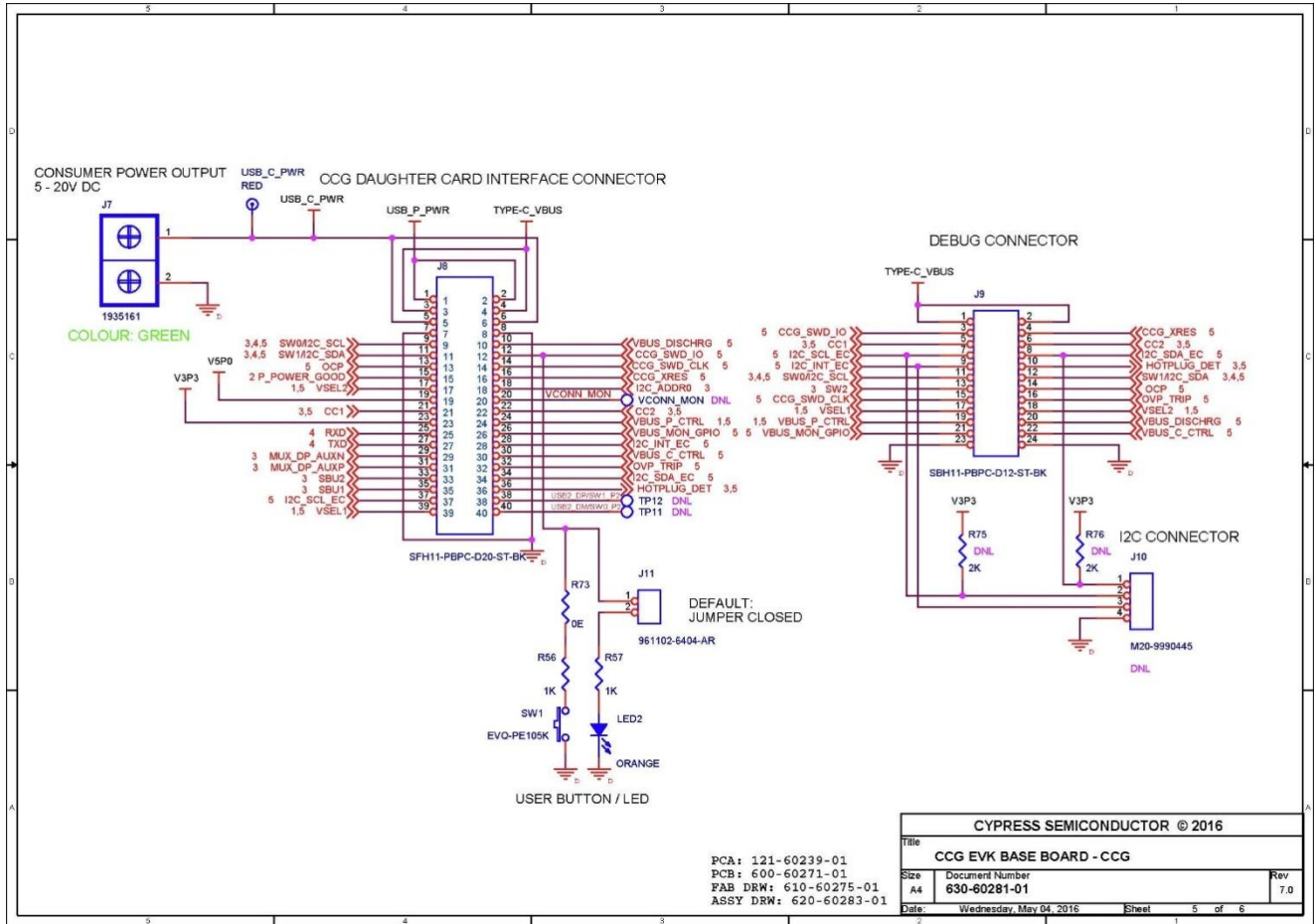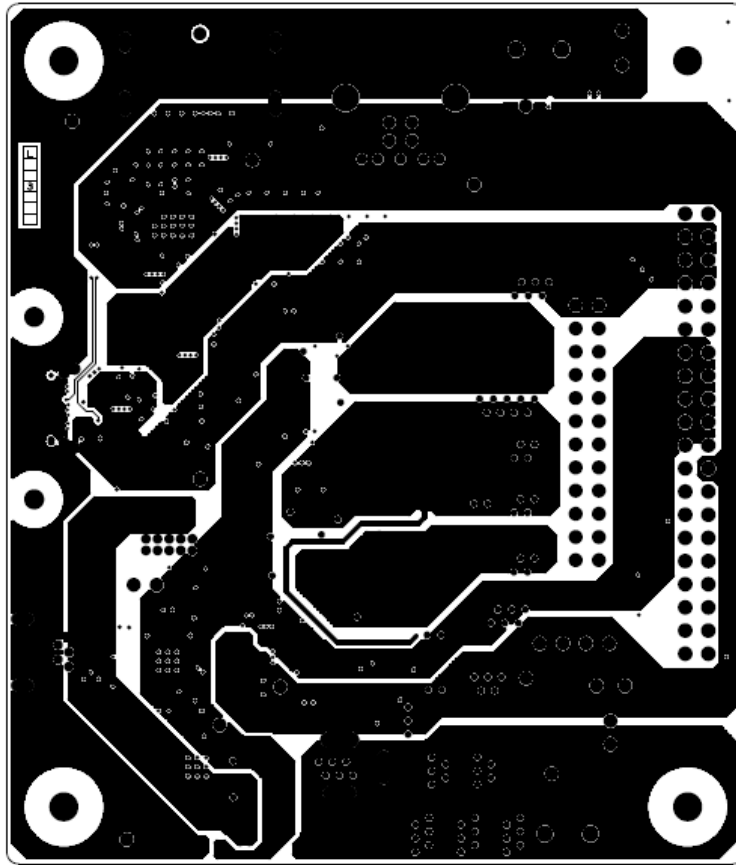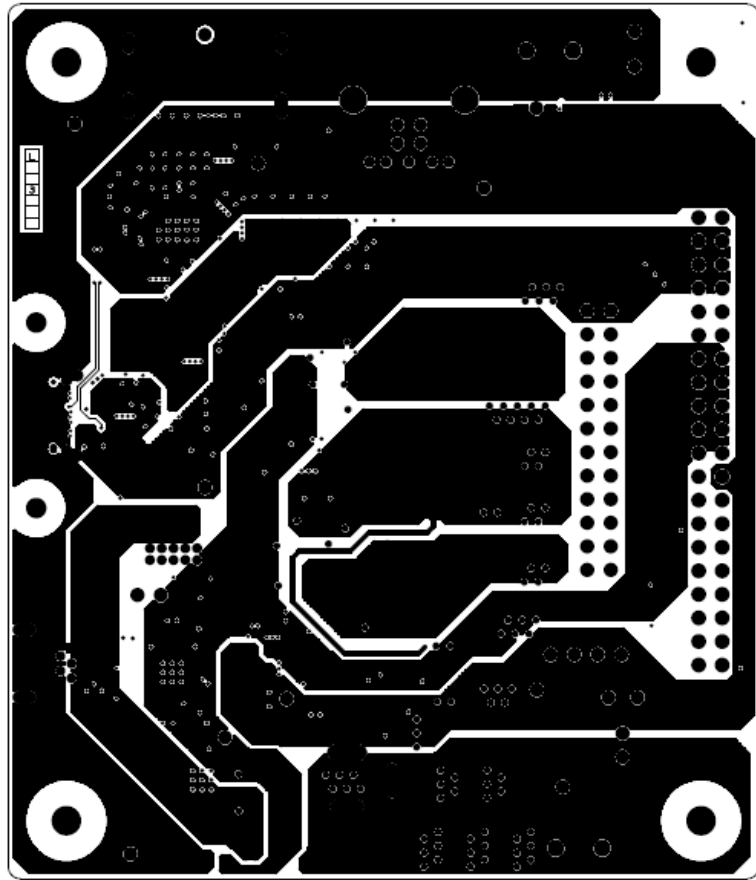| Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
1	1		600-60271-01	PCB,3.18X3.71" CAF resistant High Tg ENIG finish,6 layer, Color = BLUE, Silk = WHITE.	Cypress Approved Manufacturer	600-60271-01
2	2	C25,C26	0.01uF	CAP CER 10000PF 25V 10% X7R 0402	AVX Corporation	04023C103KAT2A
3	15	C27,C28,C29,C31,C34,C42,C44,C46,C52,C54,C63,C64,C65,C70,C71	0.1uF	CAP CER 0.1UF 10V 10% X7R 0402	TDK Corporation	C1005X7R1A104K050BB
4	4	C36,C37,C38,C39	0.22uF	CAP CER 0.22UF 16V X7R 0402	Yageo	CC0402KRX7R7BB224
5	3	C14,C50,C59	10uF	CAP CER 10UF 50V X7R 1210	Murata Electronics North America	GRM32ER71H106KA12L
6	3	C33,C45,C51	1uF	CAP CER 1UF 10V X5R 0402	Murata Electronics North America	GRM155R61A105KE15D
7	2	C61,C72	1uF	CAP CER 1UF 35V X7R 0603	TDK Corporation	C1608X7R1V105K080AC
8	1	C35	2.2uF	CAP CER 2.2UF 25V 10% X5R 0603	TDK Corporation	C1608X5R1E225K080AB
9	3	C32,C40,C74	2200pF	CAP CER 2200PF 2KV 10% X7R 1808	Johanson Dielectrics Inc.	202R29W222KV4E
10	3	C8,C47,C48	22uF	CAP CER 22UF 10V X5R 0805	Murata Electronics North America	GRM219R61A226MEA0D
11	3	C12,C41,C43	4.7uF	CAP CER 4.7UF 10V 20% X5R 0402	TDK Corporation	C1005X5R1A475M050BC
12	2	C49,C62	0.1uF	CAP CER 0.1UF 50V 10% JB 0603	TDK Corporation	C1608JB1H104K080AA
13	1	C30	4.7uF	CAP CER 4.7UF 50V X7R 1210	Murata Electronics North America	GRJ32ER71H475KE11L
14	2	C116,C118	0.1uF	CAP CER 0.1UF 50V 10% X5R 0402	TDK Corporation	C1005X5R1H104K050BB
15	1	C120	0.1uF	CAP CER 0.1UF 25V 10% X7R 0603	Murata Electronics North America	GRM188R71E104KA01D
16	1	C121	0.47uF	CAP CER 0.47UF 50V 10% X7R 0603	TDK Corporation	C1608X7R1H474K080AC
17	1	C117	1uF	CAP CER 1UF 50V 10% X5R 0603	TDK Corporation	C1608X5R1H105K080AB
18	1	C141	270pF	Capacitor, 270pF, 50V, 5%, NPO, 0402	Murata Electronics North America	GRM1555C1H271JA01D
19	3	C119,C123, C124	330uF	CAP ALUM 330UF 50V 20% SMD	Panasonic Electronic Components	EEE-FT1H331AP
20	1	C140	470pF	Capacitor, 470pF, 50V, 10%, X7R, 0603	Murata Electronics North America	GRM188R71H471KA01D
21	1	C122	8.2nF	CAP CER 8200PF 50V 10% X7R 0402	Kemet	C0402C822K5RACTU
22	3	D4,D6,D9	PMEG3050BEP,115	DIODE SCHOTTKY 30V 5A SOD128	NXP Semiconductors	PMEG3050BEP,115
23	1	D8	1N4148W	DIODE GP 75V 150MA	Vishay	1N4148WFL-G3-

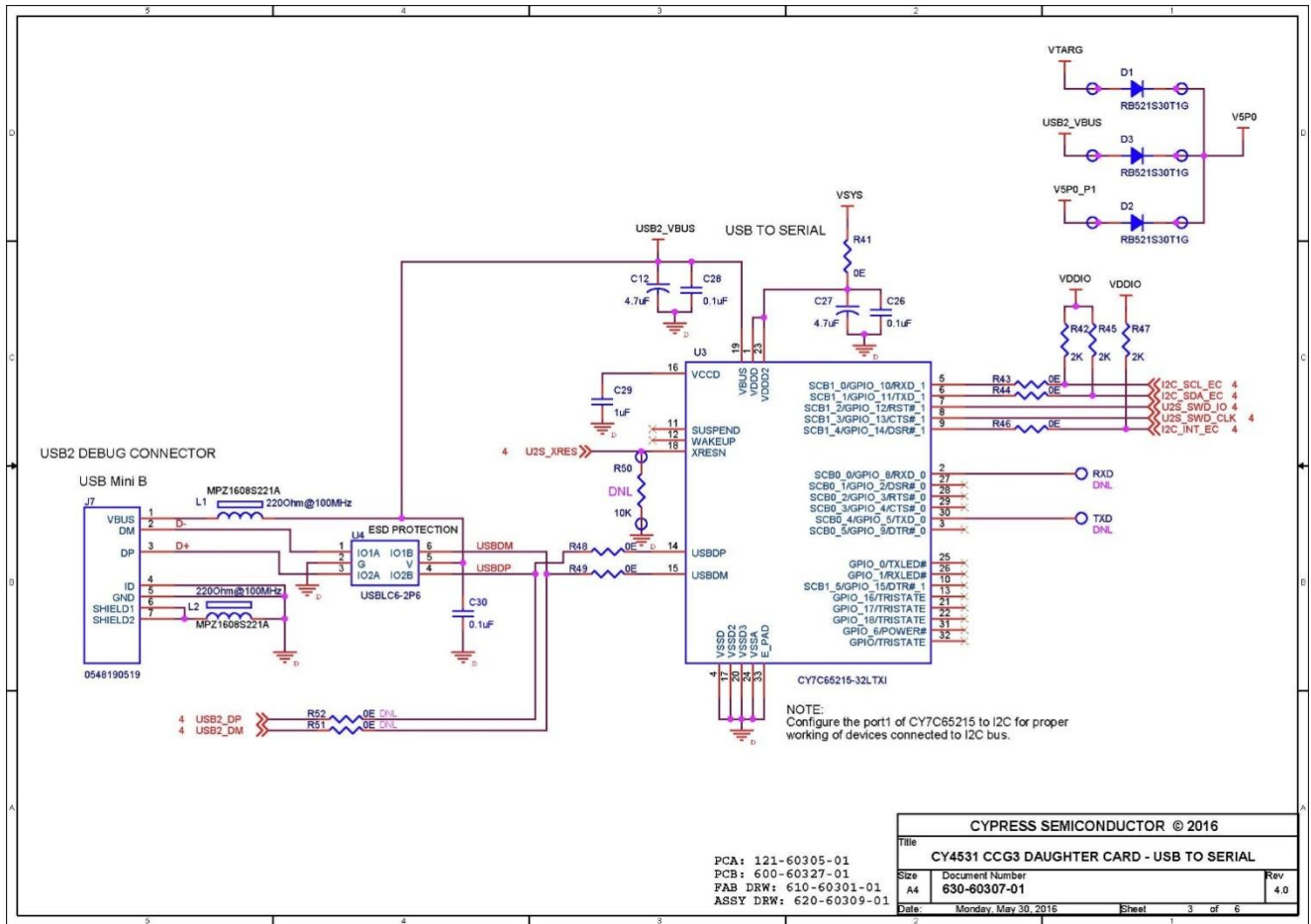| Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
			FL-G3-08	SOD123FL	Semiconductor Diodes Division	08
24	1	D10	SMBJ24A-TR	TVS DIODE 24VWM 50VC DO214AA	STMicroelectronics	SMBJ24A-TR
25	6	D11,D12,D13,D14,D16,D17	ESD105B102EL	TVS DIODE 5.5VWM 14VC TSLP-2-2	Infineon Technologies	ESD105B102ELE6327XTMA1
26	1	D15	SMBJ24CA-E3/52	TVS DIODE 24VWM 38.9VC SMB	Vishay Semiconductor Diodes Division	SMBJ24CA-E3/52
27	1	D19	MMSZ4702T1G	Diode, Zener, 15V, 0.5W, SOD123	On Semiconductor	MMSZ4702T1G
28	1	D20	MBR0540T1G	DIODE SCHOTTKY 40V 0.5A SOD123	On Semiconductor	MBR0540T1G
29	1	D21	MMSD701T1G	Diode, Shottky, 70V, 0.2A, SOD123	On Semiconductor	MMSD701T1G
30	1	J1	694106301002	CONN PWR JACK DC RIGHT ANGLE THROUGH HOLE	Wurth electronics	694106301002
31	1	J2	UEB1112C-2AK1-4H	Connector Receptacle USB TypeB 3.0, Super Speed 9 Position Through Hole, Right Angle, Horizontal	Foxconn	UEB1112C-2AK1-4H
32	1	J3	DX07S024JJ2R1300	USB TYP C TP MNT DL RW SMT RECEP	JAE Electronics	DX07S024JJ2R1300
33	1	J4	472720001	Connector Receptacle DisplayPort 20 Position Surface Mount, Right Angle, Horizontal	Molex, LLC	472720001
34	1	J5	548190519	Connector Receptacle USB - mini B 2.0 OTG 5 Position Through Hole, Right Angle, Horizontal	Molex, LLC	548190519
35	1	J7	1935161	TERM BLOCK PCB 2POS 5.0MM GREEN	Phoenix Contact	1935161
36	1	J8	SFH11-PBPC-D20-ST-BK	Connector Header 40 Position 0.100" (2.54mm) Gold Through Hole	Sullins Connector Solutions	SFH11-PBPC-D20-ST-BK
37	1	J9	SBH11-PBPC-D12-ST-BK	CONN HEADER VERT 24POS GOLD	Sullins Connector Solutions	SBH11-PBPC-D12-ST-BK
38	1	J11	961102-6404-AR	CONN HEADER VERT SGL 2POS GOLD	3M	961102-6404-AR
39	1	J12	OSTTC020162	TERMINAL BLOCK 5MM VERT 2POS PCB	On Shore Technology Inc.	OSTTC020162
40	1	L1	1uH	FIXED IND 1UH 1.8A 48 MOHM SMD	Murata Electronics North America	LQM32PN1R0MG0L
41	1	L3	10uH	FIXED IND 10UH 9A 25.5 MOHM SMD	Bourns Inc.	SRP1245A-100M
42	2	L4,L5	220Ohm @100MHz	FERRITE BEAD 220 OHM 0603 1LN 2.2A	TDK Corporation	MPZ1608S221A
43	1	L6	4.7uH	FIXED IND 4.7UH 2A 72 MOHM SMD	Bourns Inc.	SRN5020-4R7M
44	1	LED1	GREEN	LED GREEN CLEAR 0603 SMD	Lite-On Inc.	LTST-C190GKT
45	1	LED2	ORANGE	LED ORANGE CLEAR 0603 SMD	Lite-On Inc.	LTST-C190KFKT
46	2	Q3,Q4	2N7002DW-7-F	MOSFET 2N-CH 60V 0.23A SOT-363	Diodes Incorporated	2N7002DW-7-F
47	2	Q1,Q2	2N7002L	Transistor, 2N7002, N-Channel	ON	2N7002LT1G

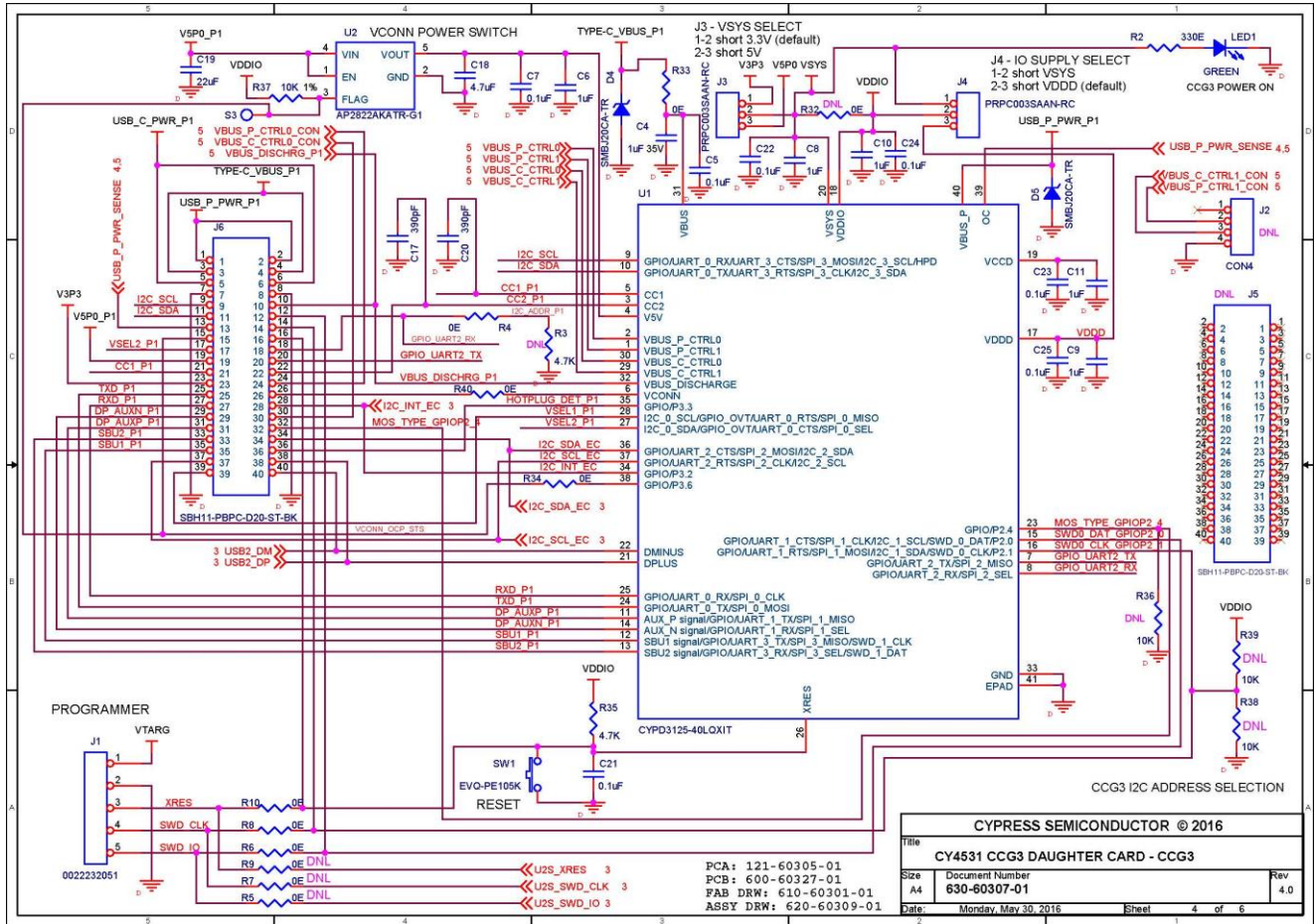| Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
			T1G	MOS-FET, 60V, 115mA, SOT-23	Semiconductor	
48	1	Q5	MMBT3904LT1	TRANS NPN 40V 0.2A SOT23	On Semiconductor	MMBT3904LT1G
49	1	Q6	NTMFS5834NL	MOSFET N-CH 40V 13A SO-8FL	On Semiconductor	NTMFS5834NLT1G
50	1	Q7	NTTFS5826NL	MOSFET N-CH 60V 8A 8-WDFN	On Semiconductor	NTTFS5826NLTAG
51	4	R111,R124,R166,R168	0E	RES SMD 0.0OHM JUMPER 1/10W 0603	Panasonic Electronic Components	ERJ-3GEY0R00V
52	7	R9,R22,R25,R61,R73,R77,R162	0E	RES 0.0 OHM 1/16W JUMP 0402 SMD	Vishay Dale	CRCW04020000Z0ED
53	13	R30,R31,R32,R33,R34,R35,R41,R47,R60,R64,R66,R67,R81	100K	RES SMD 100K OHM 5% 1/10W 0402	Panasonic Electronic Components	ERJ-2GEJ104X
54	1	R74	10K	RES 10K OHM 1/16W 1% 0402	Samsung Electro-Mechanics America, Inc	RC1005F103CS
55	1	R58	16K	RES SMD 16K OHM 1% 1/16W 0402	Yageo	RC0402FR-0716KL
56	1	R56	1K	RES SMD 1K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF1001X
57	1	R57	1K	RES SMD 1K OHM 5% 1/2W 0805	Panasonic Electronic Components	ERJ-P06J102V
58	2	R46,R51	1M	RES SMD 1M OHM 1% 1/10W 0603	Yageo	RC0603FR-071ML
59	2	R36,R37	2K	RES SMD 2K OHM 5% 1/16W 0402	Yageo	RC0402JR-072KL
60	1	R70	30K	RES SMD 30K OHM 1% 1/16W 0402	Yageo	RC0402FR-0730KL
61	1	R7	330E	RES SMD 330 OHM 5% 1/10W 0603	Yageo	RC0603JR-07330RL
62	2	R38,R40	4.7K	RES SMD 4.7K OHM 5% 1/16W 0402	Yageo	RC0402JR-074K7L
63	1	R53	4.99K	RES SMD 4.99K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF4991X
64	1	R59	5.1K	RES SMD 5.1K OHM 1% 1/16W 0402	Yageo	RC0402FR-075K1L
65	1	R29	1.13K	RES SMD 1.13K OHM 1% 1/16W 0402	Stackpole Electronics Inc.	RMCF0402FT1K13
66	1	R28	1.5K	RES SMD 1.5K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF1501X
67	1	R169	16.5K	RES SMD 16.5K OHM 1% 1/10W 0603	Stackpole Electronics Inc.	RMCF0603FT16K5
68	1	R27	2.67K	RES SMD 2.67K OHM 1% 1/16W 0402	Yageo	RC0402FR-072K67L
69	1	R24	30E	RES SMD 30 OHM 1% 1/16W 0402	Yageo	RC0402FR-0730RL
70	1	R26	5.49K	RES SMD 5.49K OHM 1% 1/16W 0402	Yageo	RC0402FR-075K49L
71	1	R23	60.4E	RES SMD 60.4 OHM 1% 1/16W 0402	Yageo	RC0402FR-0760R4L
72	1	R176	100E	RES SMD 100 OHM 1% 1/10W 0603	Panasonic Electronic	ERJ-3EKF1000V

Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
					Components	
73	6	R109,R113,R118,R125,R164,R170	10K	RES SMD 10K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF1002V
74	1	R112	14.3K	RES SMD 14.3K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF1432V
75	1	R115	100K	100k Ohm ±1% 0.1W, 1/10W Surface Mount Resistor Thick Film ±100ppm/°C 0603	Yageo	RC0603FR-07100KL
76	1	R123	16.9K	RES SMD 16.9K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF1692V
77	2	R165,R182	1K	RES SMD 1K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF1001V
78	1	R179	20E	RES SMD 20 OHM 5% 1/10W 0603	Panasonic Electronic Components	ERJ-3GEYJ200V
79	3	R129,R167,R174	20K	RES SMD 20K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF2002V
80	1	R108	300E	RES SMD 300 OHM 5% 1/10W 0603	Panasonic Electronic Components	ERJ-3GEYJ301V
81	1	R110	5.1E	RES SMD 5.1 OHM 5% 1/10W 0603	Vishay Dale	CRCW06035R10JNEA
82	1	R172	5.1K	RES SMD 5.1K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF5101V
83	1	R127	619E	RES SMD 619 OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF6190V
84	1	SW1	EVQ-PE105K	SWITCH TACTILE SPST-NO 0.05A 12V	Panasonic Electronic Components	EVQ-PE105K
85	1	U2	TPS61253	IC REG BOOST 5V 3.3A SYNC 9DSBGA	Texas Instruments	TPS61253YFFR
86	1	U3	NCP1034	IC, PWM Buck Controller, 100V, NCP1034, SOIC16	On Semiconductor	NCP1034DR2G
87	1	U4	CD74HC238PWR	IC DECODER/DEMUX HS 3-8 16-TSSOP	Texas Instruments	CD74HC238PWR
88	1	U5	PS8740B	USB Type-C Redriving Switch for USB Host / DisplayPort Source	Parade Technologies Ltd	PS8740B
89	1	U6	CY7C65215	IC USB TO UART BRIDGE DUAL 32QFN	Cypress Semiconductor	CY7C65215-32LTXI
90	1	U7	USBLC6-2P6	TVS DIODE 5.25VWM 17VC SOT666	STMicroelectronics	USBLC6-2P6
91	1	U13	RT8299AZSP	IC REG BUCK ADJ 3A SYNC 8SOP	Richtek USA Inc.	RT8299AZSP
92	1	U14	L78L05ABUTR	IC REG LDO 5V 0.1A SOT89-3	STMicroelectronics	L78L05ABUTR
93	1	U15	TS3704IPT	IC COMP QUAD CMOS MCRPWR 14TSSOP	STMicroelectronics	TS3704IPT
94	5	V3P3,V5P0,USB_P_PWR,USB_C_PWR,TYPE-C_VBUS	RED	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000
95	4	GND1,GND2,GND3,GND	BLACK	TEST POINT PC MINI .040"D	Keystone	5001

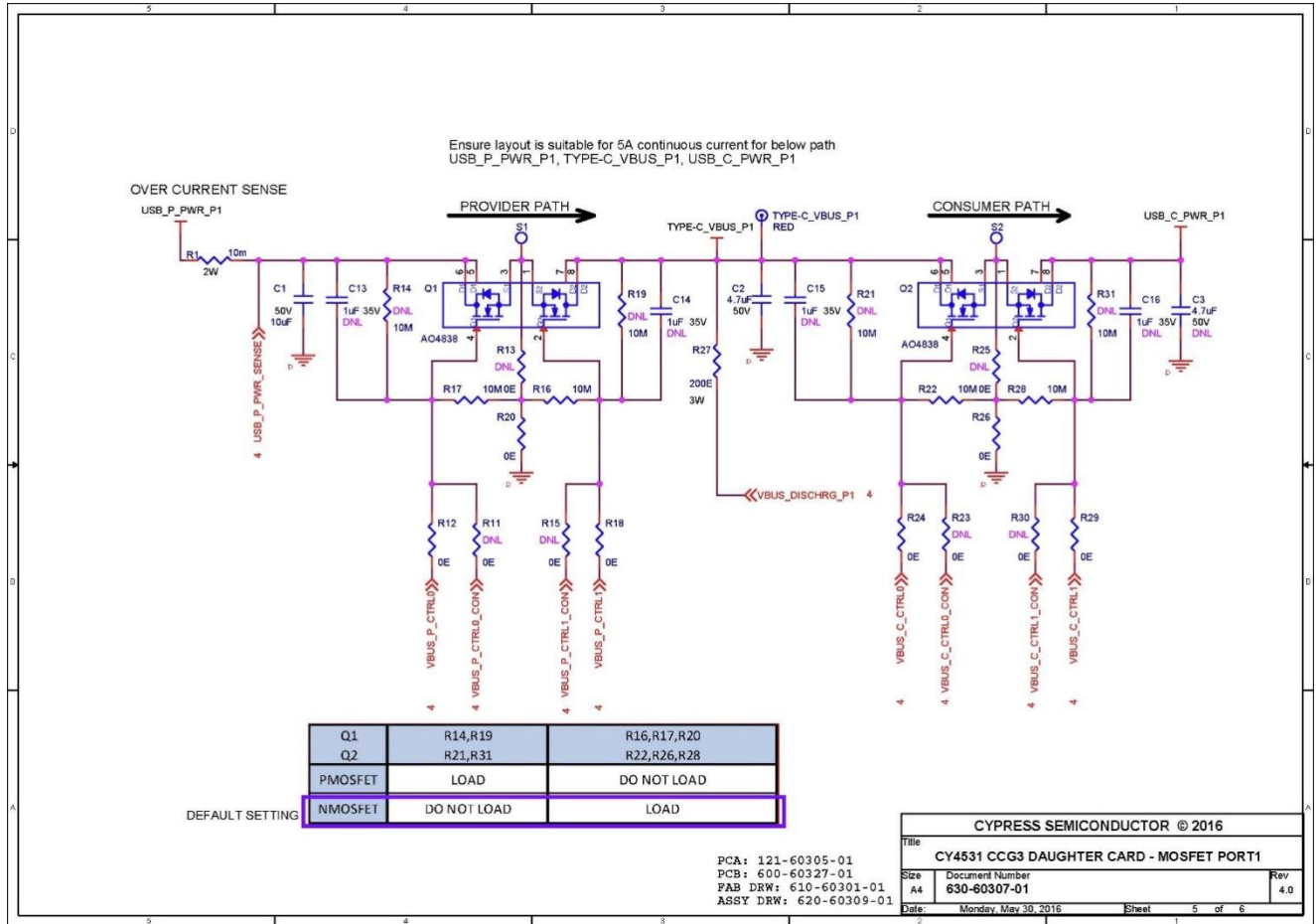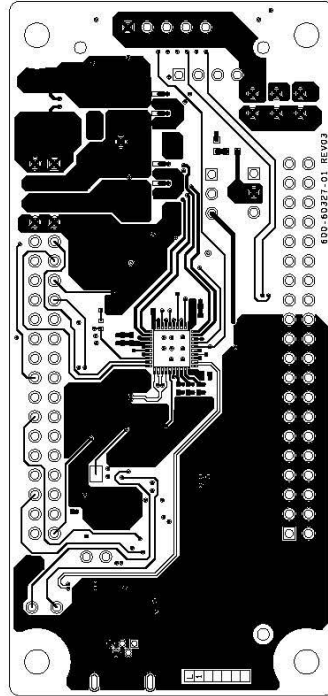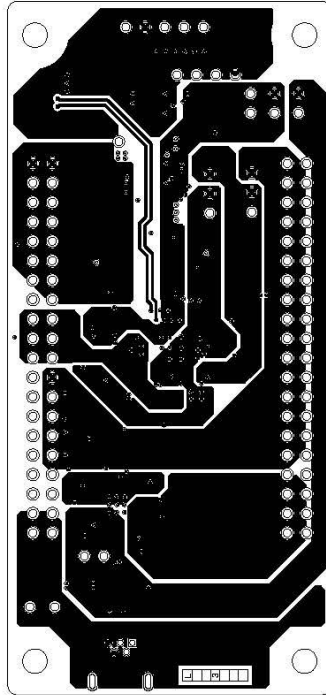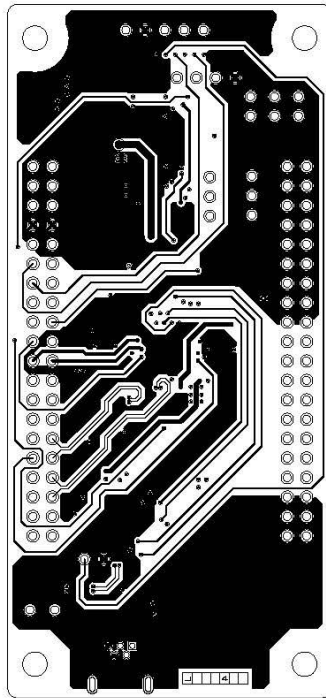| Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
		4		BLACK	Electronics	
MISC components						
96	4	Bumper	NA	BUMPER CYLIN 0.312" DIA BLK	3M	SJ61A6
97	1	Type-C Clamping Bracket	NA	Type-C Connector Bracket	Global Technology Services	Type-C Connector Clamping Bracket
98	2	M2x5mm Screws	NA	SCREW, Pan Head, machined screws, M2 x 5mm		
99	1	Jumper Plug	NA	2.54MM JUMPER PLUG WITH TEST POINT	Wurth Electronics	609002115121
100	1	Label	NA	LBL, PCA Identification Label, Vendor Code, Datecode, Serial Number(YYWWVVXXXX)	Cypress Semiconductor	
No load components						
101	1	D18	PMEG3050BEP,115	DIODE SCHOTTKY 30V 5A SOD128	NXP Semiconductors	PMEG3050BEP,115
102	1	J6	302-S101	10 Positions Header, Shrouded Connector 0.100" (2.54mm) Through Hole Gold	On Shore Technology Inc.	302-S101
103	1	J10	M20-9990445	4 Positions Header, Unshrouded, Breakaway Connector 0.100" (2.54mm) Through Hole Gold	Harwin Inc.	M20-9990445
104	5	R39,R54,R55,R79,R80	0E	RES 0.0 OHM 1/16W JUMP 0402 SMD	Vishay Dale	CRCW04020000Z0ED
105	2	R75,R76	2K	RES SMD 2K OHM 5% 1/16W 0402	Yageo	RC0402JR-072KL
106	8	R42,R43,R44,R45,R48,R49,R50,R52	4.7K	RES SMD 4.7K OHM 5% 1/16W 0402	Yageo	RC0402JR-074K7L
107	1	R65	10K	RES 10K OHM 1/16W 1% 0402	Samsung Electro-Mechanics America, Inc	RC1005F103CS
108	1	R68	100K	RES SMD 100K OHM 5% 1/10W 0402	Panasonic Electronic Components	ERJ-2GEJ104X
109	1	R177	5.49K	RES SMD 5.49K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF5491V
110	3	TP11,TP12,VCONN_MON	YELLOW	TEST POINT PC MINI .040"D YELLOW	Keystone Electronics	5004
111	3	Vfb,V_SYS,DP_PWR	RED	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000

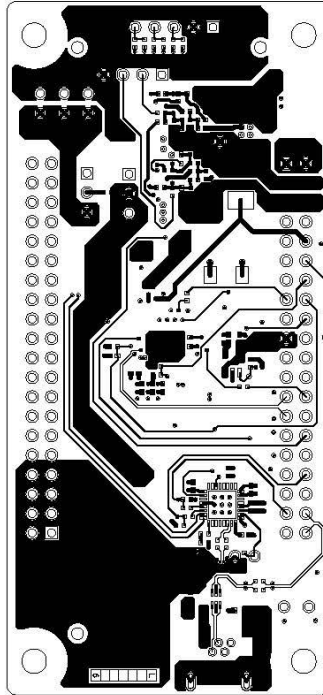## 6.3 CCG3 EVK Daughter Card

6.3.1 Schematics

6.3.2 Gerber Files

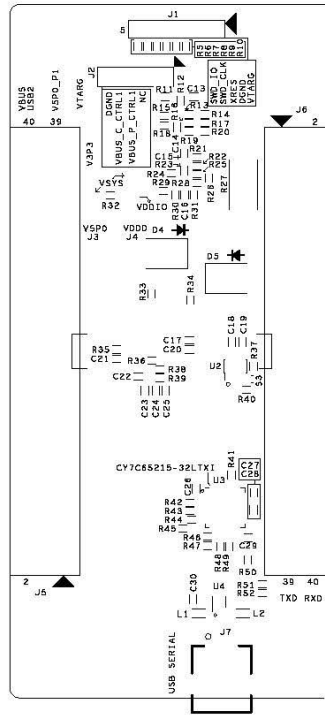600-60327-01 REV03 PRIMARY SIDE

600-60327-01 REV03 POWER LAYER

600-60327-01 REV03 SIGNAL LAYER

600-60327-01 REV03 SECONDARY SIDE

600-60327-01 REV03 PRIMARY SILKSCREEN

600-60327-01 REV03 SECONDARY SILKSCREEN

6.3.3 Bill of Materials

Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
1	1		600-60327-01	PCB,3.56X1.66" CAF resistant High Tg ENIG finish,6 layer, Color = BLUE, Silk = WHITE.	Cypress Approved Manufacturer	600-60327-01
2	1	C1	10uF	CAP CER 10UF 50V X7R 1210	Murata Electronics North America	GRM32ER71H106KA12L
3	1	C2	4.7uF	CAP CER 4.7UF 50V X7R 1210	Murata Electronics North America	GRJ32ER71H475KE11L
4	1	C4	1uF	CAP CER 1UF 35V X5R 0402	TDK Corporation	C1005X5R1V105K050BC
5	9	C5,C7,C22,C23,C24,C25,C26,C28,C30	0.1uF	CAP CER 0.1UF 50V X7R 0402	TDK Corporation	C1005X7R1H104K050BB
6	6	C6,C8,C9,C10,C11,C29	1uF	CAP CER 1UF 10V X5R 0402	Murata Electronics North America	GRM155R61A105KE15D
7	1	C21	0.1uF	CAP CER 0.1UF 10V 10% X7R 0402	TDK Corporation	C1005X7R1A104K050BB
8	3	C12,C18,C27	4.7uF	CAP CER 4.7UF 10V 20% X5R 0402	TDK Corporation	C1005X5R1A475M050BC
9	1	C19	22uF	CAP CER 22µF 6.3V 20% X5R 0402	Samsung Electro-Mechanics America Inc.	CL05A226MQ5QUNC
10	2	C17,C20	390pF	CAP CER 390pF 50V X7R 0402	Murata Electronics North America	GRM155R71H391KA01D
11	3	D1,D2,D3	RB521S30T1G	DIODE SCHOTTKY 30V 200MA SOD523	ON Semiconductor	RB521S30T1G
12	2	D4,D5	SMBJ20CA-TR	TVS DIODE 20VWM 42.8VC SMB	STMicroelectronics	SMBJ20CA-TR
13	1	J1	22232051	CONN HEADER 5POS .100 VERT TIN	Molex, LLC	22232051
14	2	J3,J4	PRPC003SAAN-RC	CONN HEADER .100" SNGL STR 3POS	Sullins Connector Solutions	PRPC003SAAN-RC
15	1	J6	SBH11-PBPC-D20-ST-BK	CONN HEADER 2.54MM 40POS GOLD	Sullins Connector Solutions	SBH11-PBPC-D20-ST-BK
16	1	J7	548190519	CONNECTOR RECEPTACLE USB - MINI B 2.0 OTG 5 POSITION THROUGH HOLE, RIGHT ANGLE, HORIZONTAL	Molex, LLC	548190519
17	1	LED1	GREEN	LED GREEN CLEAR 0603 SMD	Lite-On Inc.	LTST-C190GKT
18	2	L1,L2	220Ohm@100MHz	FERRITE CHIP 220 OHM 2A 0603	TDK Corporation	MPZ1608S221A
19	2	Q1,Q2	AO4838	MOSFET 2N-CH 30V 11A 8SOIC	Alpha & Omega Semiconductor Inc.	AO4838
20	1	R1	10m	RES SMD 0.01 OHM 1% 2W 2512	Rohm Semiconductor	PMR100HZPFU10L0
21	1	R2	330E	RES SMD 330 OHM 5% 1/10W 0603	Yageo	RC0603JR-07330RL
22	19	R4,R6,R8,R10,R12,R18,R20,R24,R26,R29,R33,R34,R40,R41,R43,R44,R46,R48,R49	0E	RES 0.0 OHM 1/16W JUMP 0402 SMD	Vishay Dale	CRCW04020000Z0ED
23	4	R16,R17,R22,R28	10M	RES SMD 10M OHM 5% 1/16W 0402	Rohm Semiconductor	TRR01MZPJ106
24	1	R27	200E	RES SMD 200 OHM 1% 3W 2512	TE Connectivity AMP Connectors	3522200RFT
25	1	R35	4.7K	RES SMD 4.7K OHM 5% 1/16W 0402	Yageo	RC0402JR-074K7L

Item	Qty	Reference	Value	Description	Manufacturer	Mfr Part Number
26	1	R37	10K	RES 10K OHM 1/16W 1% 0402	Samsung Electro-Mechanics America Inc.	RC1005F103CS
27	3	R42,R45,R47	2K	RES SMD 2K OHM 5% 1/16W 0402	Yageo	RC0402JR-072KL
28	1	SW1	EVQ-PE105K	SWITCH TACTILE SPST-NO 0.05A 12V	Panasonic Electronic Components	EVQ-PE105K
29	1	TYPE-C_VBUS_P1	RED	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000
30	1	U1	CYPD3125-40LQXIT	EZ-PD CCG3 - USB Type-C Port Controller	Cypress Semiconductor	CYPD3125-40LQXIT
31	1	U2	AP2822AK ATR-G1	IC USB POWER SWITCH SOT25	Diodes Incorporated	AP2822AKATR-G1
32	1	U3	CY7C65215-32LTXI	IC USB TO UART BRIDGE DUAL 32QFN	Cypress Semiconductor	CY7C65215-32LTXI
33	1	U4	USBLC6-2P6	TVS DIODE 5.25VWM 17VC SOT666	STMicroelectronics	USBLC6-2P6
No load components						
34	1	C3	4.7uF	CAP CER 4.7UF 50V X7R 1210	Murata Electronics North America	GRJ32ER71H475KE11L
35	4	C13,C14,C15,C16	1uF	CAP CER 1UF 35V X5R 0402	TDK Corporation	C1005X5R1V105K050BC
36	1	J2	CON4	CONN HEADER .100" SNGL STR 4POS	Sullins Connector Solutions	PRPC004SAAN-RC
37	1	J5	SBH11-PBPC-D20-ST-BK	CONN HEADER 2.54MM 40POS GOLD	Sullins Connector Solutions	SBH11-PBPC-D20-ST-BK
38	2	TXD,RXD	YELLOW	TEST POINT PC MINI .040"D YELLOW	Keystone Electronics	5004
39	1	R3	4.7K	RES SMD 4.7K OHM 5% 1/16W 0402	Yageo	RC0402JR-074K7L
40	12	R5,R7,R9,R11,R13,R15,R23,R25,R30,R32,R51,R52	0E	RES 0.0 OHM 1/16W JUMP 0402 SMD	Vishay Dale	CRCW04020000Z0ED
41	4	R14,R19,R21,R31	10M	RES SMD 10M OHM 5% 1/16W 0402	Rohm Semiconductor	TRR01MZPJ106
42	4	R36,R38,R39,R50	10K	RES 10K OHM 1/16W 1% 0402	Samsung Electro-Mechanics America Inc.	RC1005F103CS

Revision History

Document Revision History

Document Title: CY4531 EZ-PD™ CCG3 Evaluation Kit Guide			
Document Number: 002-10218			
Revision	Issue Date	Origin of Change	Description of Change
**	02/19/2016	VGT	New EVK user guide.
*A	06/23/2016	VGT	Added schematics, gerber layouts, & bill of materials for the CCG3 base board and daughter card. Added the Programming the CCG3 Device on CY4531 CCG3 EVK section.
*B	8/17/2016	VGT	Updated CY4531 CCG3 EVK board images through the document. Added brief descriptions of EZ-PD Configuration Utility & CCGx Software Development Kit at the beginning of Chapter 4.