



CY4532

EZ-PD™ CCG3PA Evaluation Kit Guide

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Safety Information

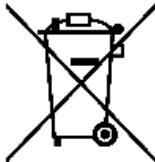


The CY4532 EZ-PD™ CCG3PA EVK is intended for use as a evaluation platform for hardware or software in a laboratory environment. The board is an open-system design, which does not include a shielded enclosure. Due to this reason, the board may cause interference to other electrical or electronic devices in close proximity. In 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 CY4532 EZ-PD CCG3PA Evaluation Kit 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 CY4532 EZ-PD CCG3PA EVK 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 CY4532 EZ-PD CCG3PA 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.

Do's and Don'ts



- Use only a compatible 1-Cell or 2-Cell Li-Ion battery. Ensure that battery is connected to the Battery Terminal (J1) of CY4532 Power Board as per the marked polarity (+/-) on the hardware. Refer to [5](#) for more details.
- Supply 12 V DC input only at the DC Jack (J3) of CY4532 Power Board.
- Do NOT exceed 24 V DC input at the DC Terminal (J2) of CY4532 Power Board.
- Do NOT connect any battery at the DC Terminal (J2) of CY4532 Power Board.
- Do NOT supply DC input at Load Terminals (J4 and J5) of CY4532 Power Board.
- Do NOT connect DC input at the DC Jack (J3) and battery at Battery Terminal (J1) simultaneously.
- Do NOT apply more than 6.5 V on the test points.
- Do NOT apply reverse voltage on the test points.
- Do NOT connect USB Type-C Power Adapter to the USB Type-C port (J13) located on the CY4532 Power Board.

1. Introduction



The CY4532 EZ-PD™ CCG3PA Evaluation Kit (EVK) is based on the CCG3PA product family of Cypress's USB Type-C microcontrollers. This EVK is intended to be an evaluation vehicle for USB Type-C Power Adapter (PA) and USB Type-C Power Bank (PB) applications. The kit can be configured for a PA or PB application using a combination of firmware, jumper settings on the kit hardware, and external accessories. The following paragraphs provide a brief description of both applications:

- **USB Type-C Power Adapter (PA):** To charge a device such as a mobile phone or notebook which supports battery charging through the Type-C interface. The device can be connected to the Type-C port on the CY4532 EVK's Main Board to be charged as per the USB Power Delivery (PD) protocol. This application requires a DC input to be supplied to the EVK.

In addition to charging through the USB Type-C port, the EVK also supports charging through a USB Type-A port to enable battery charging of legacy devices. The CY4532 EVK supports Battery Charging (BC) 1.2, Qualcomm Quick Charge (QC) 3.0, Apple 2.4A charging and Samsung Adaptive Fast Charging (AFC) charging protocols on the USB Type-A port.

- **USB Type-C Power Bank (PB):** This application is similar to the PA application. Here, a 1-Cell or 2-Cell Lithium-ion battery, which is connected to the CY4532 EVK acts as the power source to support charging on USB Type-C and USB Type-A ports. In addition, the battery can be charged using a USB Type-C Power Adapter connected to the USB Type-C port of the EVK's Main Board.

In addition to the applications described above, the CY4532 Power Board can be used as a Programmer for Cypress EZ-PD CCGx Products supporting Configuration Channel (CC) bootloading. Refer to [5](#) for more details.

1.1 Kit Contents

The CY4532 EZ-PD CCG3PA EVK consists of the following contents:

- CY4532 EZ-PD CCG3PA EVK Power Board
- CY4532 EZ-PD CCG3PA EVK Main Board (pre-mounted on the CY4532 EVK Power Board)
- 12 V 24 W DC Power Adapter
- Quick Start Guide

1.1.1 Hardware Not Included With Kit

The CY4532 EZ-PD CCG3PA EVK does not come with all of the hardware needed to perform the demonstrations documented in sections [Power Adapter \(PA\) Demo](#) and [Power Bank \(PB\) Demo](#) of the [Kit Operation](#) chapter. The following items are not included:

- A USB Type-C device that can consume power over the Type-C port (example: laptop or mobile phone with USB Type-C port)
- A device that can be charged over the USB Type-A interface (example: mobile phone which can be charged through the USB port)
- 1-cell (2.7 V–4.2 V) or 2-cell (5.4 V–8.4 V) Li-ion battery
- USB Type-C Power Adapter. This is required to charge the battery attached to the CY4532 EVK in PB use-case.

- USB cables required for connecting the devices to the USB Type-C and Type-A ports

1.2 Getting Started

For instructions on how to run a quick demonstration and observe the kit functionality, refer to the [Power Adapter \(PA\) Demo](#) section.

1.3 Acronyms

Table 1-1. Acronyms Used in this Document

Acronym	Definition
AFC	Adaptive Fast Charging
BC	Battery Charging
CC	Configuration Channel
CCG	Cable Controller Generation
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
IC	Integrated Circuit
I2C	Inter-Integrated Circuit
LED	Light-Emitting Diode
OCP	Over Current Protection
PA	Power Adapter
PB	Power Bank
PDO	Power Data Object
PMIC	Power Management Integrated Circuit
PS	Power Supply
PSoC®	Programmable System-on-Chip
QC	Quick Charge
SWD	Serial Wire Debug

Acronym	Definition
UART	Universal Asynchronous Receiver Transmitter
UFP	Upstream Facing Port
USB	Universal Serial Bus
USB-PD	Universal Serial Bus Power Delivery

2. Kit Installation



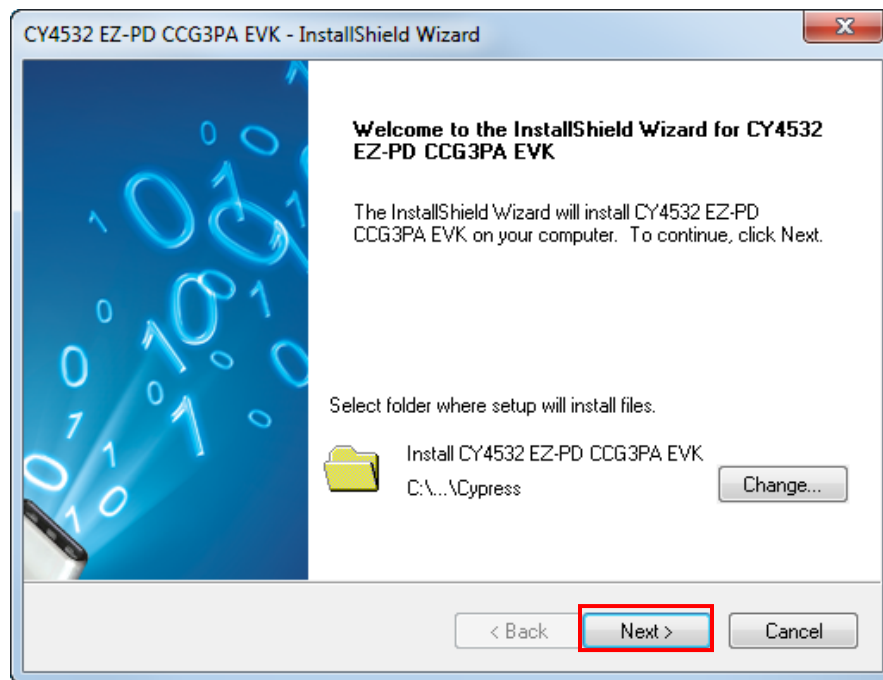
This chapter describes the procedure to install the CY4532 EZ-PD CCG3PA EVK software.

2.1 CY4532 EZ-PD™ CCG3PA EVK Kit Software Installation

To install the kit software, follow these steps:

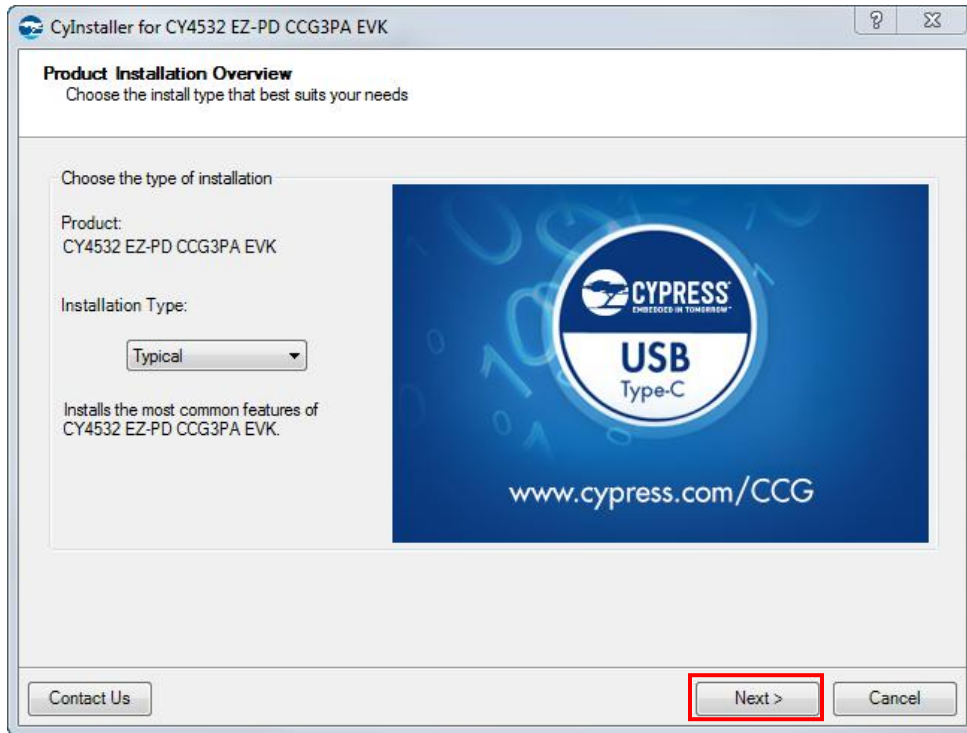
1. Download the latest kit software setup file “CY4532Setup.exe” from the kit’s web page www.cypress.com/CY4532. This package contains the kit hardware files, firmware binaries, and the kit documentation (Kit Guide, Quick Start Guide, and Release Notes). Double-click on the executable to start the installation. Click **Next** when the screen shown in [Figure 2-1](#) appears.

Figure 2-1. CY4532 EZ-PD CCG3PA EVK Installer Screen



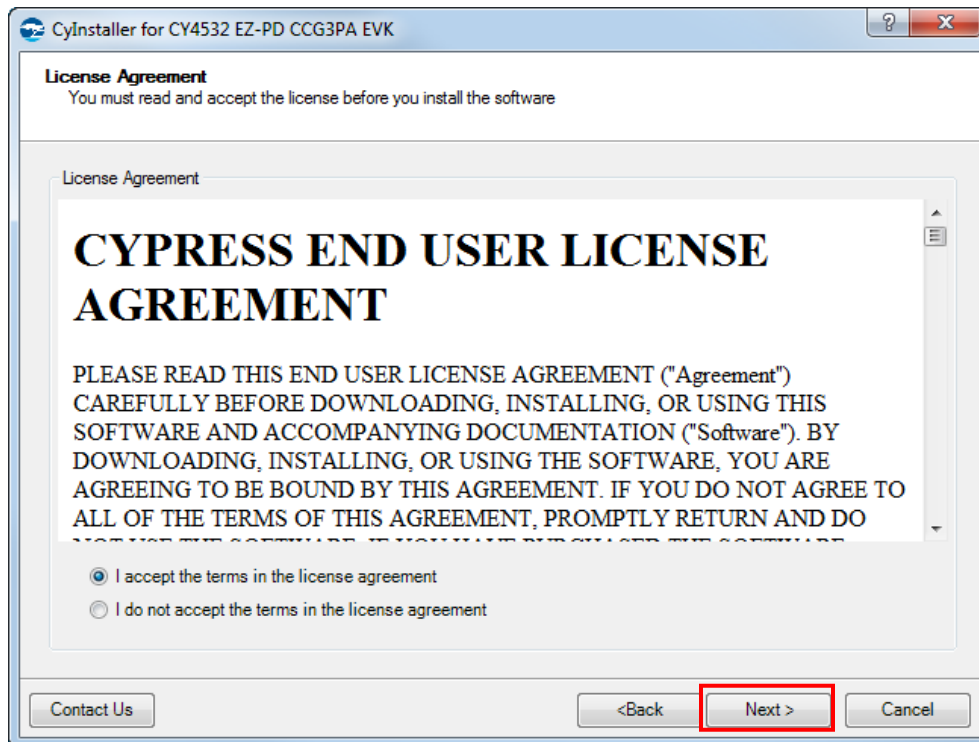
2. Select the required **Installation Type** and click **Next** to start the install ([Figure 2-2](#)). For first-time installation, it is recommended that you select **Typical** as the **Installation Type**.

Figure 2-2. Installation Wizard



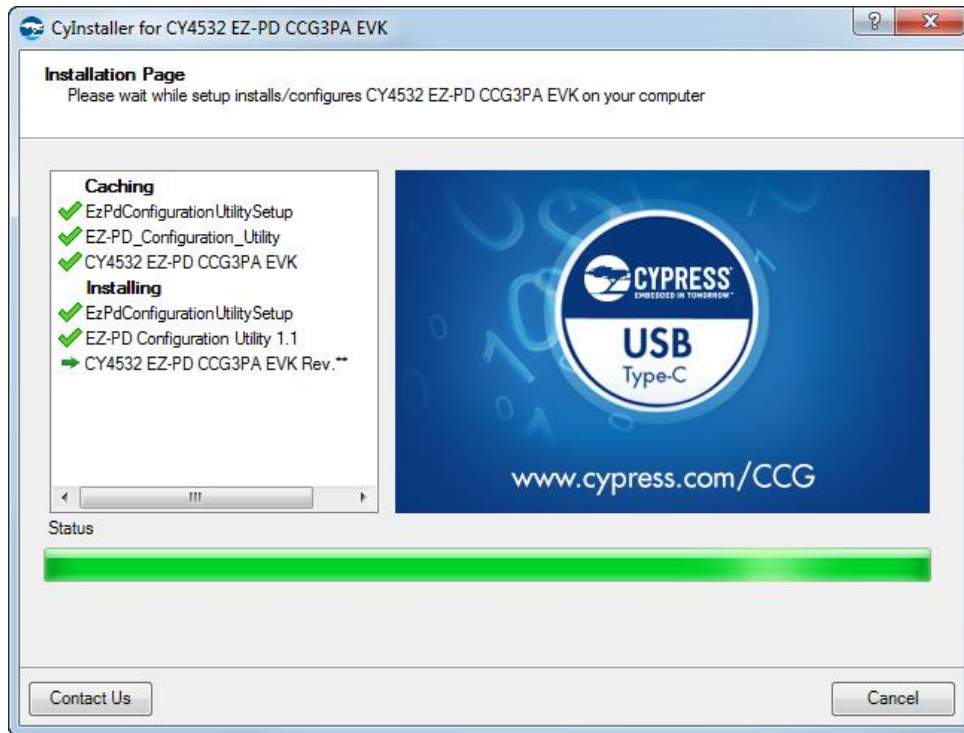
3. Accept the license agreement for the software components and click **Next** (Figure 2-3).

Figure 2-3. License Agreement



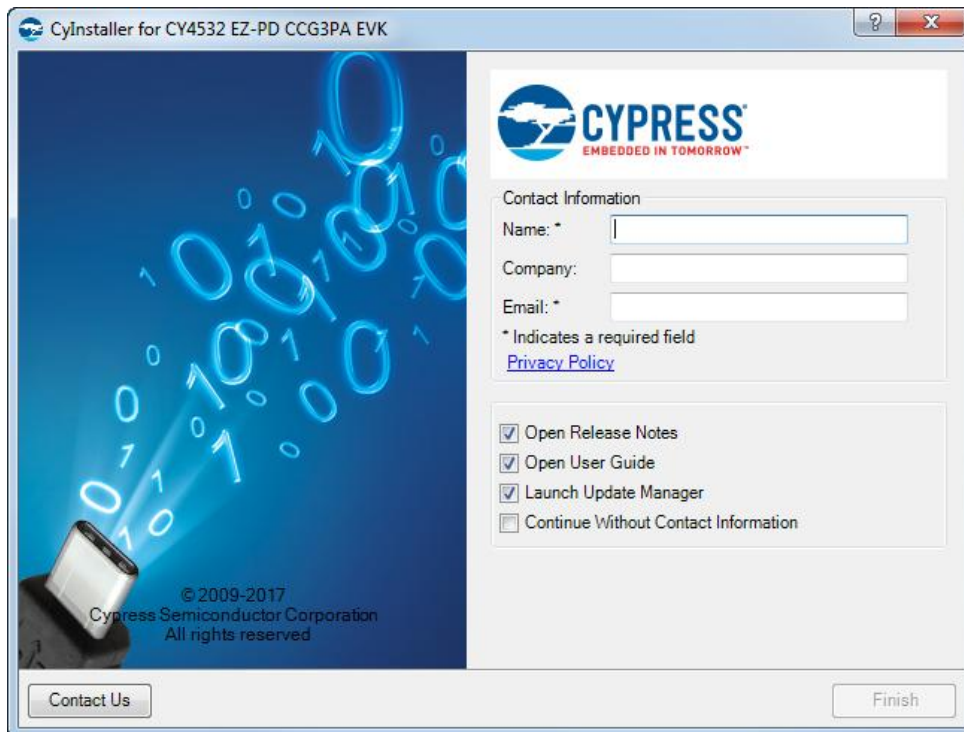
4. Figure 2-4 shows the installation progress.

Figure 2-4. Installation Progress



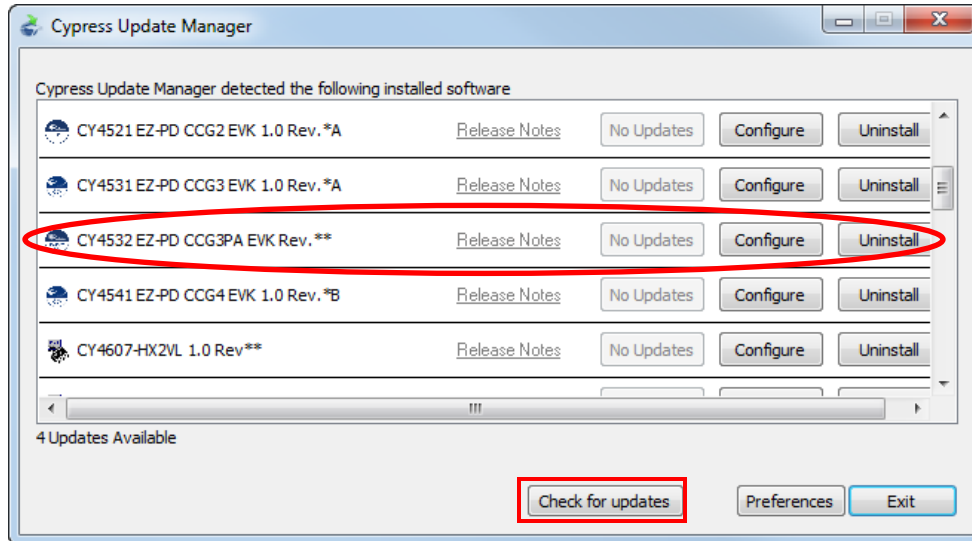
5. Enter the **Contact Information** or select **Continue Without Contact Information** and click **Finish**. (Figure 2-5).

Figure 2-5. Software Installation Complete



- 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 CY4532 EZ-PD CCG3PA 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**.

- After the installation is complete, the contents are available at the following location: <Install Directory>\CY4532 EZ-PD CCG3PA 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. CY4532 System Design Details



3.1 CY4532 EVK System Overview

This section provides details on the system capabilities of the CY4532 EVK. The kit supports USB Type-A and USB Type-C ports for charging.

3.1.1 Power Adapter Application

For a Power Adapter (PA) application, the input power source is the DC adapter provided with the EVK. It is rated for 24 W (12 V/2 A) of power, so the total output power including both charging ports is limited to 24 W. Applications may charge two devices simultaneously, one on the USB Type-A port and other on the USB Type-C port, if these adhere to the 24-W limit, failing which the charging may intermittently or completely stop.

Specifications for the DC adapter to be used with the CY4532 EVK are given below:

Table 3-1. Specifications of the DC Adapter to Use with CY4532 EVK

Parameter	Min	Max
DC Voltage	6 V	12 V
DC Current	-	5 A

Table 3-2 lists the charging protocols supported on the USB Type-A port:

Table 3-2. Charging Protocols Supported on USB Type-A Port

Protocol	CY4532 Operating Specification
BC 1.2 (Battery Charging)	5 V 500 mA
QC 2.0 (Qualcomm Quick Charge)	5 V 2.4 A 9 V 1.5 A 12 V 1.2 A
Samsung AFC (Adaptive Fast Charging)	9 V 2 A
Apple Charging	5 V 2.4 A

Table 3-3 lists the charging protocols supported on the USB Type-C port:

Table 3-3. Charging Protocols Supported on USB Type-C Port

Protocol	CY4532 Operating Specification
USB Type-C and PD	Supported PDOs: 5 V 3A 9 V 2A
QC 3.0 (Qualcomm Quick Charge)	3.6 V – 12 V 2A

If an application uses a USB Type-C-to-Type-A converter on the USB Type-C port, all the charging protocols supported on the USB Type-A port of the EVK are applicable.

The USB Type-C port has the over-current protection (OCP) feature implemented in the system. If the charging current exceeds the negotiated contract current by more than 30%, CCG3PA will treat this as fault and stop charging on the USB Type-C port.

Applications that exceed the CY4532 operating specification need a DC adapter with higher power rating; however it should not exceed the specification mentioned in [Table 3-1](#). Changes in the PA firmware are also required for exceeding the CY4532 operating specifications to avoid OCP fault on the USB Type-C port.

3.1.2 Power Bank Application

For Power Bank (PB) applications, use standard-quality Li-Ion batteries.

[Table 3-4](#) lists the specifications for the battery to be used for CY4532 Kit for 2-Cell and 1-Cell operation.

Table 3-4. Specification of 2-Cell and 1-Cell batteries

Parameter	2-Cell Specification		1-Cell Specification	
	Min	Max	Min	Max
DC Voltage	5.5 V	8.4 V	3.7 V	4.2 V
Charging Current	200 mA	3 A	200 mA	3 A
Discharging Current	3 A	5 A	3 A	5 A

Charging protocols listed in [Table 3-2](#) and [Table 3-3](#) are applicable for the Power Bank application as well.

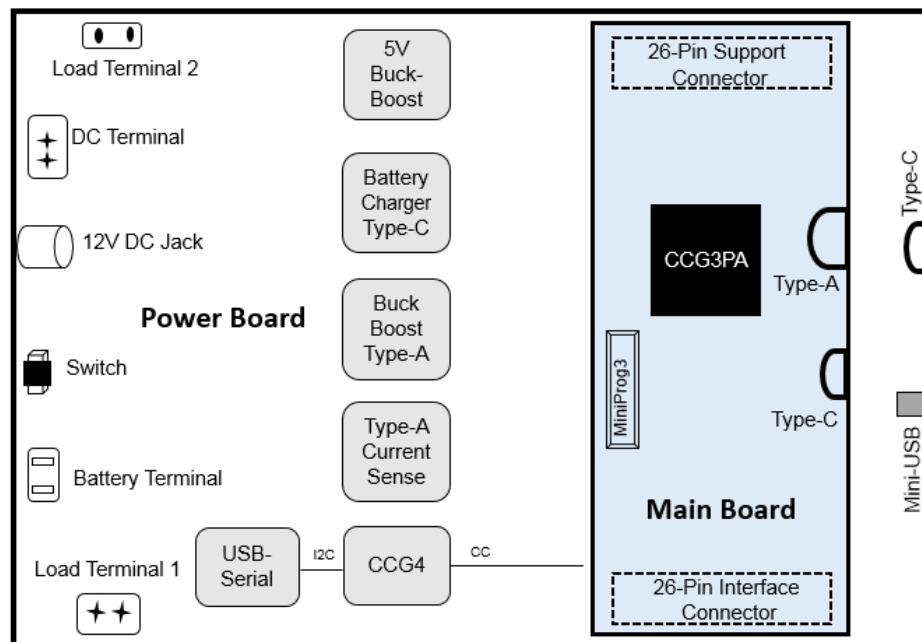
For applications that exceed the CY4532 operating specifications, a higher current rated battery is desired; however the battery should not exceed specifications listed in [Table 3-4](#). For exceeding the CY4532 operating specifications, applicable changes in PB firmware are also required to avoid OCP fault on the USB Type-C port.

It is recommended to use 2-Cell batteries as the maximum charging current supported by the EVK with 1-Cell battery operation is limited to 1.5 A. The charging may stop when the charging current exceeds 1.5 A.

3.2 CY4532 EVK Hardware Overview

The CY4532 EZ-PD CCG3PA EVK consists of a Power Board and Main Board. The Main Board is pre-mounted on the Power Board during manufacturing. The CCG3PA device is located on the Main Board. The CY4532 hardware architecture is captured in [Figure 3-1](#).

Figure 3-1. CY4532 EZ-PD CCG3PA EVK Architecture



The CY4532 Power Board consists of following key components:

- A DC Input
- A Battery Input Terminal
- A Mini-USB connector to download firmware to CCG3PA
- A Type-C port to enable programming of an external CCG3PA based hardware
- Regulators to support battery charging and to provide power for the USB Type-C and USB Type-A charging.

The CY4532 Main Board consists of following key components:

- CCG3PA silicon (CYPD3171-24LQXQ)
- Type-C and Type-A ports
- MiniProg3 SWD header.

The Main Board is mounted on the Power Board using two 26-pin connectors.

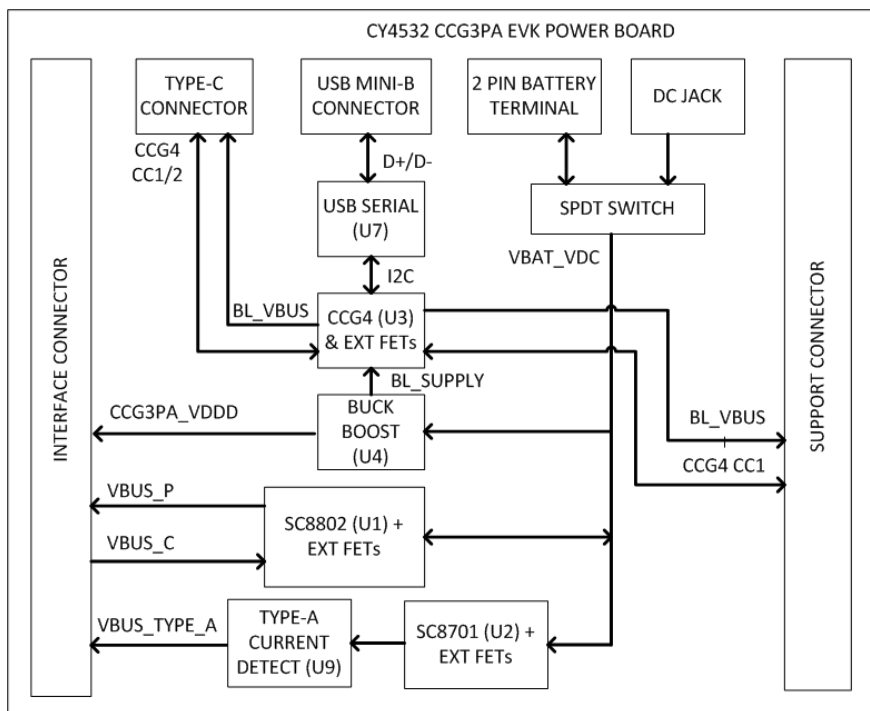
3.3 CY4532 Power Board

The CY4532 Power Board implements all the interfaces and logic to provide the required power supplies to the CY4532 Main Board. This board provides interfaces to connect a DC power input (for PA application) or a battery input terminal (for PB application).

3.3.1 Block Diagram

The block diagram of the CY4532 Power Board is shown in Figure 3-2. It provides two interfaces (DC Barrel Jack and DC Screw Terminals) to provide DC input power using an AC-DC power adapter or using a bench supply respectively. It also includes a Battery Terminal to connect a 1-cell or 2-cell Li-ion battery. The input power mechanism (DC supply or battery) is selected using a switch (SW1).

Figure 3-2. CY4532 Power Board Block Diagram



The Power Board contains the following key parts:

- **SC8802 (U1):** This is a bidirectional buck boost regulator connected to the USB Type-C port on the main board. In the PA application, this part regulates the VBUS (VBUS_P) voltage from 3 V to 20 V on the USB Type-C port as per the PD contract negotiated with the device being charged. The input voltage range for this part is 2.7 V to 24 V.

In the PB application, when the battery is being charged, this part provides power from the VBUS input (VBUS_P) to the battery. The VBUS voltage of 3 V to 20 V supplied from a USB Type-C charger is fed to this part and it controls the power supplied to the battery as per the battery type (1-cell or 2-cell).

- **SC8701 (U2):** This is a buck boost regulator connected to the USB Type-A port located on the CY4532 EVK Main Board. In both the PA and PB applications, it supplies power from the DC input/battery to provide the VBUS output (VBUS_TYPE_A) on the Type-A port. The input voltage range for this part is 2.7 V to 24 V.
- **TPS63060DSCR (U4):** This is a buck boost regulator that provides a constant 5 V output. The input supply to this part is provided through the DC input or the battery based on the SW1 switch setting. The output from this part is used as listed below:
 - To provide the VDDD supply to the CCG3PA device located on the CY4532 EVK Main Board
 - To provide 5 V on the USB Type-A port of the CY4532 EVK Main Board to detect a device plug-in
 - To provide VBUS on the USB Type-C port of the CY4532 EVK Power Board to enable flashing of an external CCG3PA based hardware

- **CYPD4126-40LQXI (U3):** This is a Cypress CCG4 controller part. It enables downloading firmware on to the CCG3PA part (which is located on the CY4532 EVK Main Board) using the EZ-PD configuration utility. It is connected to the CCG3PA device using the CC lines. The CCG4 controller is connected to a Cypress USB-Serial part (U7) over I²C to receive the CCG3PA firmware.

Note: The CY4532 EVK Power Board can be used as an external CCG3PA programming accessory. The CY4532 EVK Main Board need not be connected to the Power Board for this use case. The CC lines of the CCG4 part are terminated at a USB Type-C receptacle on the Power Board. External CCG3PA based hardware can be connected to this USB Type-C receptacle to download firmware using the EZ-PD configuration utility running on a PC.

- **CY7C65211 (U7):** This is Cypress’s USB-Serial part that is connected to the USB Mini-B connector (J12) of the CY4532 EVK Power Board. It is also connected to the CCG4 part over I²C. This part enables downloading the firmware on to the CG3PA device (which is located on the CY4532 EVK Main Board) through the USB Mini-B port of the CY4532 Power Board.

3.3.2 Features

Table 3-5 shows the features of the CY4532 EVK Power Board.

Table 3-5. CY4532 EVK Power Board Features

Feature	Description
Power Supplies	The input power can be provided through the DC input interface or the battery. The input supply is fed to the SC8802 and SC8701 to enable charging through USB Type-C and USB Type-A ports. In addition, SC8802 supports charging of a battery connected to the Power Board Note: The DC power adapter provided with the kit can support only up to 2 A (at 12 V). The CY4532 EVK will not work with 5 V DC power adapters.
CY4532 Main Board Connectors	Two 26-pin connectors (Interface Connector and Support Connector) are available on the Power Board to connect it to the Main Board
Firmware Download Interface	The CCG3PA firmware can be downloaded to the CCG3PA device located on the Main Board through the USB Mini-B interface available on the Power Board.

3.3.3 Connectors and Jumper Settings

Figure 3-3 shows the CY4532 Power Board connectors and the default jumper settings. Table 3-6 contains the detailed description of the connectors and jumper settings.

Figure 3-3. CY4532 Power Board Connectors

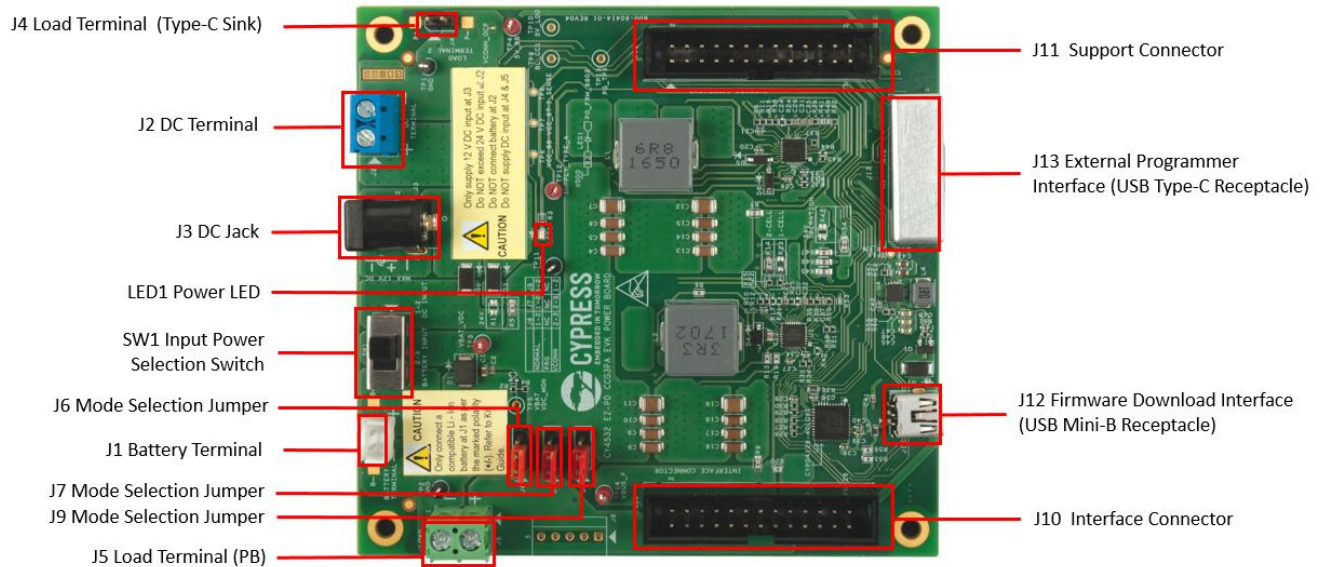


Table 3-6. CY4532 Power Board Connector/Jumper/LED Description

Connector/Jumper	Description	Type	Purpose	Default State
J1	Battery Terminal	Input	To connect a 1-cell or 2-cell Li-ion battery. Battery voltage range: 2.7 V (Min) to 8.4 V (Max)	NA
J2	DC Terminal	Input	To connect any external power supply with the board Supply voltage range: 6 V (Min) to 24 V (Max) The board's default configuration does not support the usage of this terminal. Refer to the CY4532 EVK's Power Board schematics to understand the usage of this terminal.	NA
J3	DC Jack	Input	12 V DC power adapter provided with the kit can plugged into this jack. The AC/DC adapter shipping with the kit will provide 12 V with a current up to 2 A. If you need additional power sourcing, you can use your choice of power adapter that can source more current at 12 V.	NA
J4	Load Terminal 2 (Type-C Sink)	Output	For future use	NA
J5	Load Terminal 1 (PB)	Output	To connect an external electronic load for the PB application to emulate the battery charging current Load range: 0 A (Min) to 5 A (Max) Note: Make sure to connect the load on J5 and not on J4.	NA
J6, J7 & J9	Mode Selection Jumpers	Input	To configure the Power Board between PA and PB & Firmware Download modes	Short pins 1 & 2
J10	Interface Connector	Input/Output	To connect various control signals from the CCG3PA to the regulators.	NA
J11	Support Connector	Input/Output	To connect CCG4's CC signals and other signals between the Power board and the Main board	NA
J12	USB Mini-B receptacle	Input/Output	Interface to download firmware on to the CCG3PA part	NA
J13	USB Type-C receptacle	Input/Output	External CCG3PA programming interface	NA
LED1	Power LED	Output	LED to indicate turning on of the SC8802 regulator and battery charging	NA

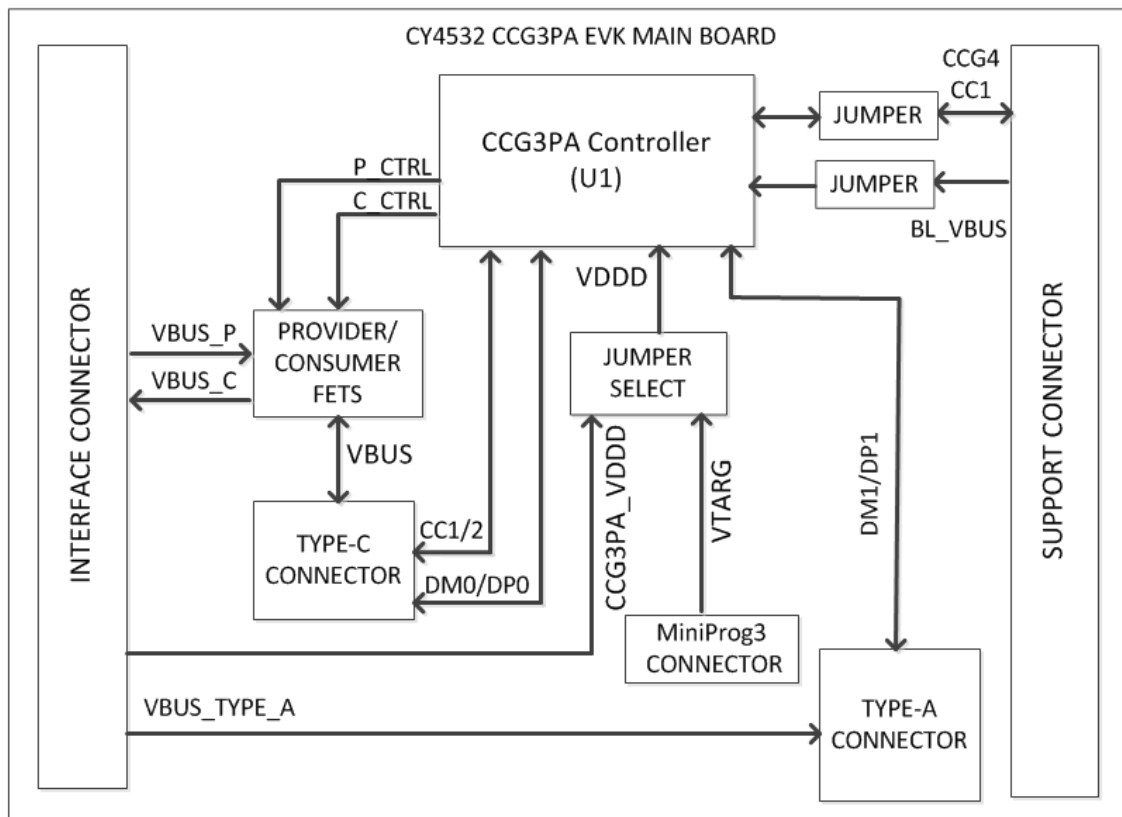
3.4 CY4532 Main Board

The CY4532 Main Board consists of the CCG3PA silicon (CYPD3171-24LQXQ), USB Type-C and USB Type-A ports and a MiniProg3 SWD header. The Main Board is mounted on the Power Board using two sets of connectors.

3.4.1 Block Diagram

Figure 3-4 shows the block diagram of the CY4532 EVK Main Board.

Figure 3-4. CY4532 EVK Main Board Block Diagram



The Main Board contains the following key parts:

- **CYPD3171-24LQXQ (U1):** This is the CCG3PA controller with the required control logic to implement PA and PB applications.

3.4.2 Features

Table 3-7 lists the features of the CY4532 EVK Main Board

Table 3-7. CY4532 EVK Main Board Features

Feature	Description
CCG3PA controller	CYPD3171-24LQXQ part is located on the Main Board. This part implements the PA and PB control functionality.
USB Type-C Source/Sink Port	A USB Type-C receptacle to attach devices that can consume power over a USB Type-C port (PA and PB applications) and to charge the battery connected to the power board (PB application)
USB Type-A Source Port	A USB Type-A receptacle to attach devices that can consume power over USB Type-A. CY4532 supports QC 3.0, BC 1.2, Apple 2.4A, and Samsung AFC charging protocols.
Programming	SWD pins to debug/program CCG3PA using MiniProg3 (not required if the EZ-PD configuration utility is used)

3.4.3 Connectors and Jumper Settings

Figure 3-5 shows the CY4532 Main Board connectors and default settings of the jumpers. Table 3-8 contains the detailed description of the connectors and jumper settings.

Figure 3-5. CY4532 EVK Main Board Connector/Jumper Settings

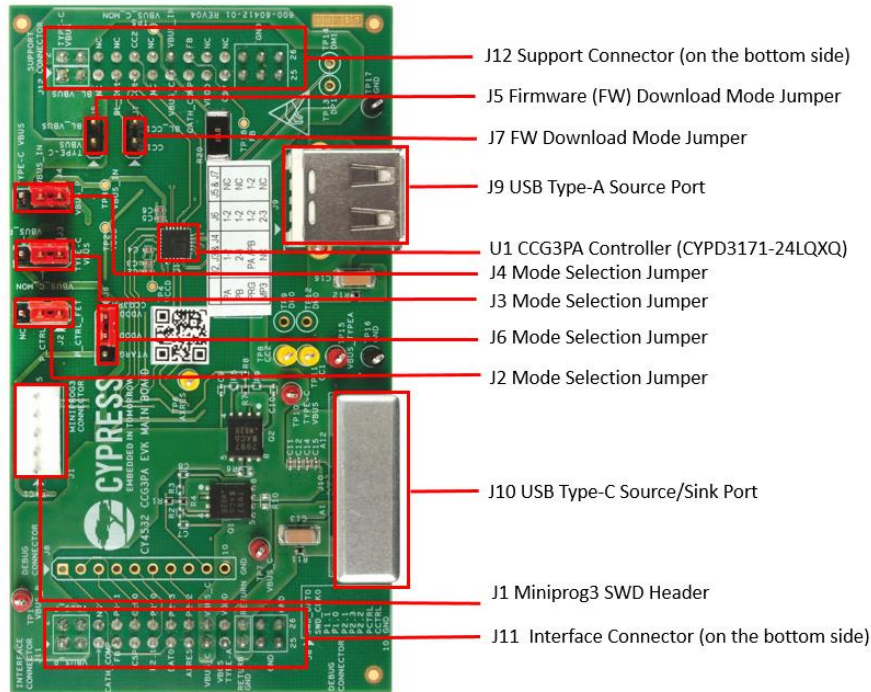


Table 3-8. CY4532 EVK Main Board Connector/Jumper Description

Connector/Jumper	Description	Type	Purpose	Default State
J2, J3, J4 and J6	Mode Selection Jumper	Input	To configure the Main Board for PA/ PB/ FW download/ MiniProg3 mode Note: Current consumed by the CCG3PA controller can be measured at J6 at any point of time.	Short pins 1 and 2
J5 & J7	FW Download Mode Jumper	Input	To enable firmware download through the USB Mini-B connector located on the Power Board	Open
J9	USB Type-A Source Port (Type-A receptacle)	Input/ Output	USB Type-A receptacle to attach devices that can consume power over a USB Type-A port	NA
J10	USB Type-C Source/Sink Port (Type-C receptacle)	Input/ Output	USB Type-C receptacle to attach devices which can consume power over a Type-C port (PA and PB applications) and to charge the battery connected to the EVK (PB application)	NA
J11	Interface Connector	Input/ Output	To connect the control signals from CCG3PA to the power regulators.	NA
J12	Support Connector	Input/ Output	To connect CCG4's CC signals and other signals between the Power board and Main board	NA

4. Programming the EZ-PD™ CCG3PA Controller



The CCG3PA controller on the CY4532 EZ-PD CCG3PA EVK is pre-programmed with the latest Power Adapter firmware binary image at the time of manufacturing. However, a newer firmware image may be available on the [CY4532 EZ-PD CCG3PA EVK webpage](#) and with the CY4532 EZ-PD CCG3PA EVK installer. The firmware version of the onboard CCG3PA controller can be verified by using the [EZ-PD Configuration Utility](#) as shown in [Figure 4-4](#). If the onboard CCG3PA controller's firmware version does not match with the latest version on the [CY4532 EZ-PD CCG3PA EVK webpage](#), follow the steps in this chapter to reprogram the CCG3PA device with the latest firmware. Device configuration parameters (such as vendor ID, Power Data Objects (PDOs), etc) can be updated using the [EZ-PD Configuration Utility](#). Refer to the EZ-PD Configuration Utility User Manual available at the [EZ-PD Configuration Utility Web Page](#).

4.1 Programming the CCG3PA Controller on the CY4532 EVK

4.1.1 Procedure to Program the CCG3PA Controller

The EZ-PD Configuration Utility is a Windows Application, which can be used to configure and program the CCG3PA controller on the CY4532 Main Board. Steps to update the firmware running on the CCG3PA controller are as follows:

1. Download and install the latest kit software setup file "CY4532Setup.exe" from the kit's web page: www.cypress.com/CY4532. This installs the EZ-PD Configuration Utility as well.
2. Set the jumpers on the CY4532 Main Board and Power Board as follows:

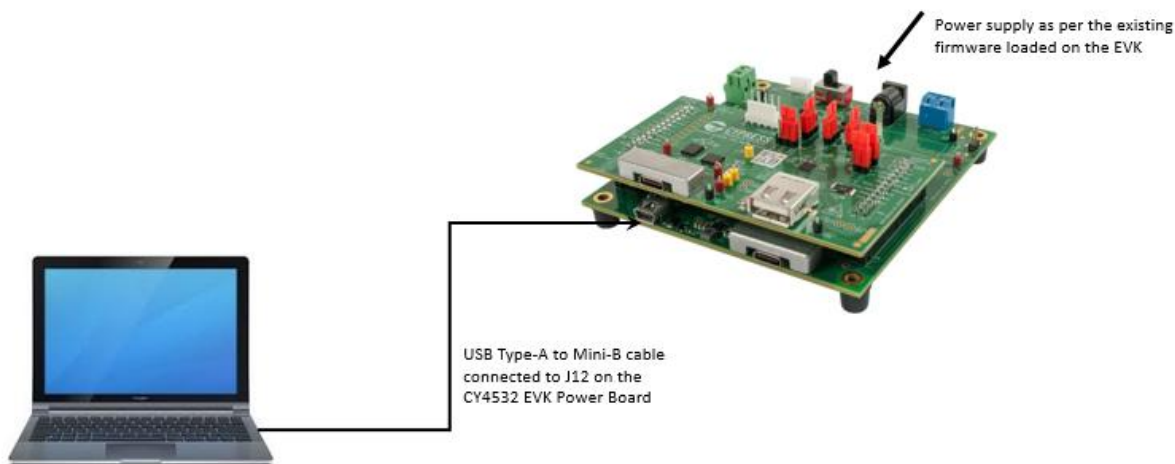
Table 4-1. CY4532 EVK Jumper Settings for programming the CCG3PA Controller

Board Type	Jumper Header	Status
Main Board	J2	Short 1 and 2 if the existing FW loaded on the EVK is PA firmware. Short 2 and 3 if PB firmware is loaded
	J3	
	J4	
	J6	Short 1 and 2
	J5	
	J7	
Power Board	J6	Open
	J7	Open
	J9	Open

Note: See [Appendix C](#) for instructions to identify the firmware type which is already loaded on the EVK.

3. Apply power to the EVK as per the existing firmware loaded on the EVK. If PA firmware is loaded, power the EVK using the DC Input. If PB firmware is loaded, power the EVK using the Battery Input. Make sure that the Input Power Selection Switch (SW1) is set as per the type of power input used.
4. Connect a USB Type-A to Mini-B cable from a host PC to connector J12 on the Power Board as shown in [Figure 4-1](#).

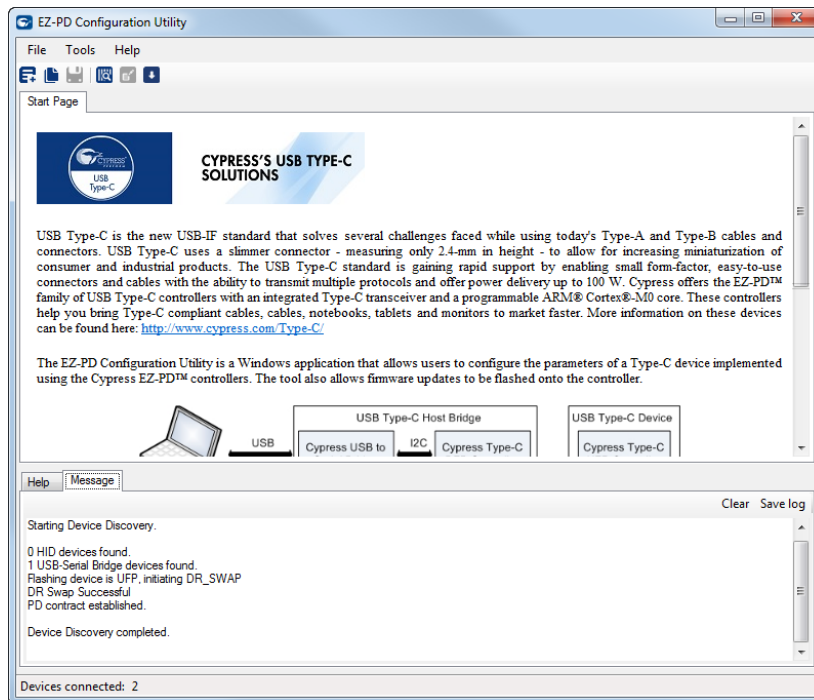
Figure 4-1. Programming the CCG3PA Controller on the CY4532 EZ-PD CCG3PA EVK



5. Launch the EZ-PD Configuration Utility as shown in Figure 4-2. After installation, the EZ-PD Configuration Utility is available on the start menu at:

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

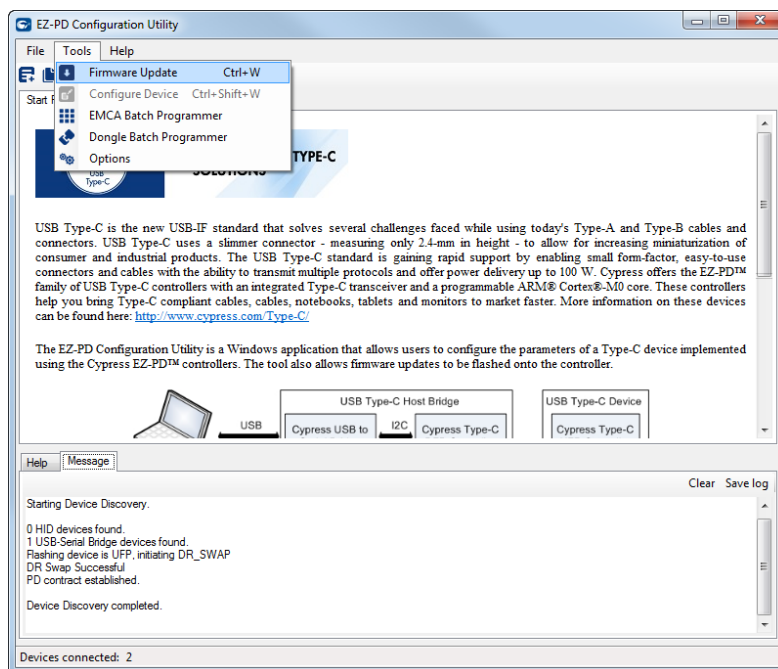
Figure 4-2. EZ-PD Configuration Utility



Confirm that the Utility's status bar shows the connection with two devices as shown in Figure 4-2.

6. Select **Tools > Firmware Update** to update the firmware of the CCG3PA controller as shown in Figure 4-3. Refer to the Utility's User Manual available at [EZ-PD Configuration Utility Web Page](#) for more details. This document can also be opened by clicking **Help > User Manual** in the EZ-PD Configuration Utility.

Figure 4-3. Upgrading the CCG3PA Firmware



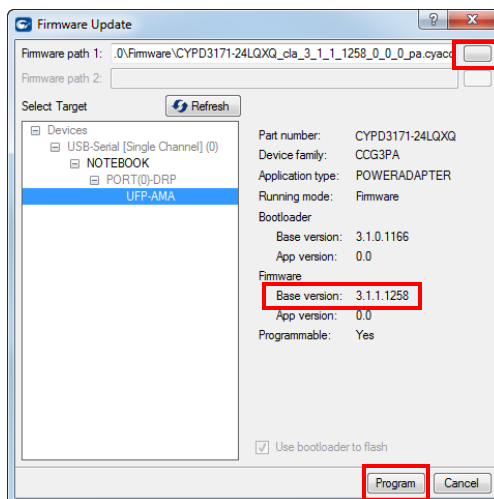
7. Download the latest firmware images from the [CY4532 EZ-PD CCG3PA EVK](#) web page. Select the type of firmware (PA / PB application). The firmware filenames are:-

- o PA: CYPD3171-24LQXQ_cla_<version>_pa.cyacd
- o PB: CYPD3171-24LQXQ_pb_<version>_pb.cyacd

The CCG3PA controller firmware is provided in the .cyacd format. The latest firmware binary for each application and the standard part numbers are provided on the [CY4532 EZ-PD CCG3PA EVK](#) webpage. The firmware images are also available at the following location after the CY4532 EZ-PD CCG3PA EVK installation:
 <Install_Directory>\CY4532 EZ-PD CCG3PA EVK\1.0\Firmware

8. Select **UFP-AMA** from the **Select target** list shown in [Figure 4-4](#). Click the button located next to the **Firmware path 1** widget at the top of the window and navigate to the FW image location on disk.

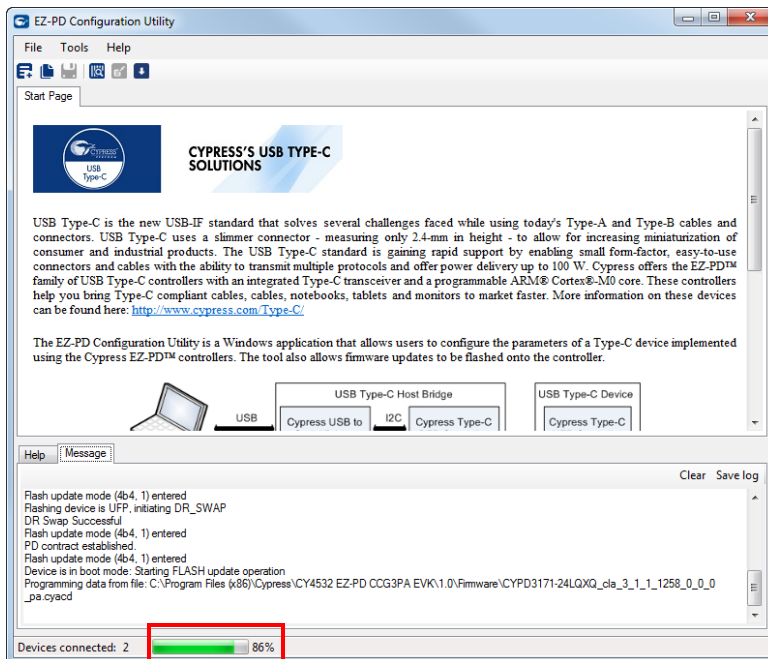
Figure 4-4. Updating Firmware Using EZ-PD Configuration Utility



Note: The current firmware version is displayed as **Base version** under **Firmware** as shown in Figure 4-4.

9. Upon clicking **Program**, the firmware update process is initiated. The status bar at the bottom of the utility will show the progress. The firmware update process can take around 6 minutes to complete.

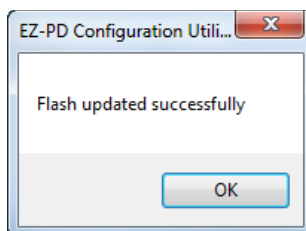
Figure 4-5. Firmware Update Process



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

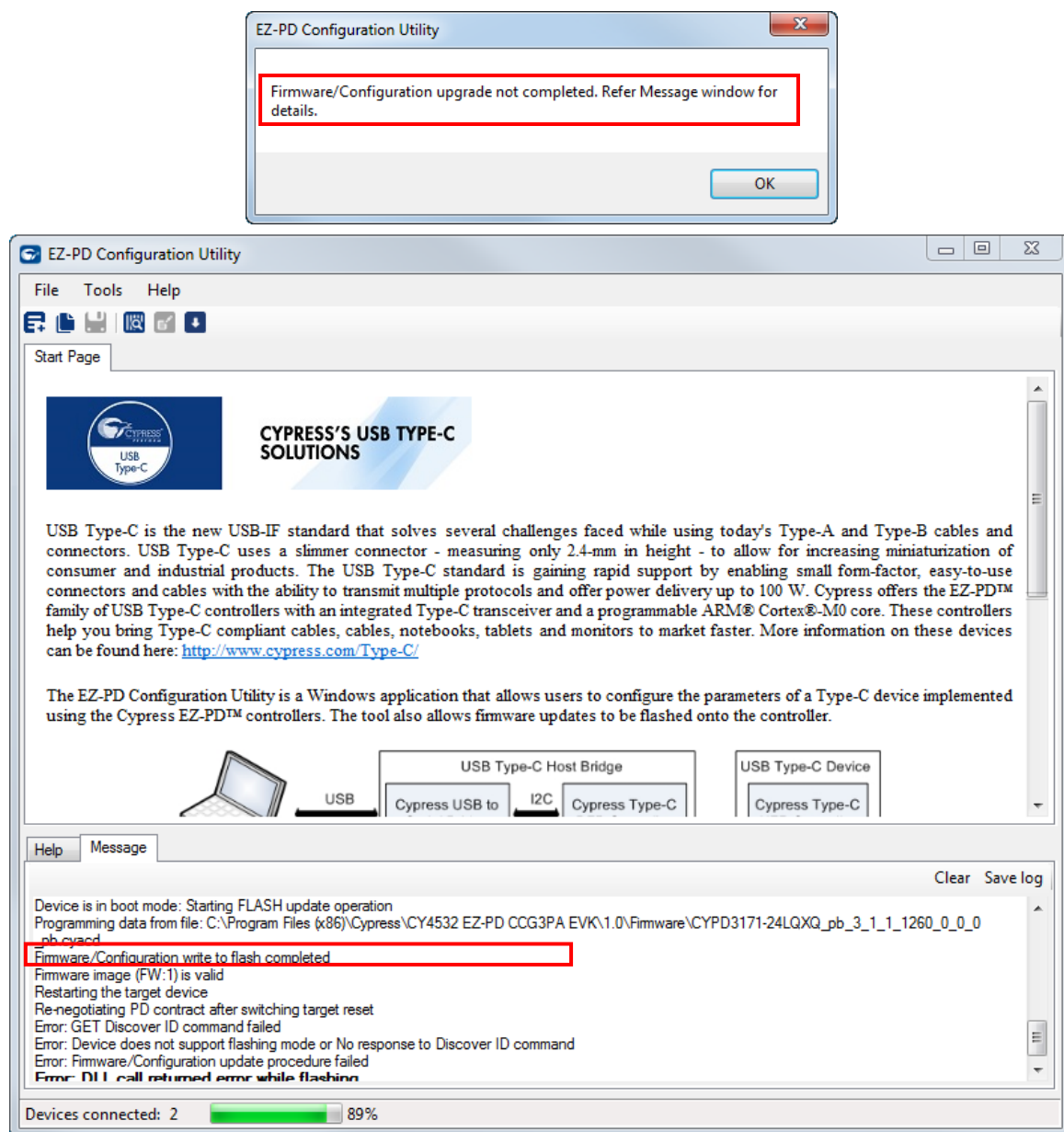
10. Upon successful completion of the firmware update process, a window with the message “Flash updated successfully” is displayed as shown in Figure 4-6. Click **OK**.

Figure 4-6. Completion of Firmware Update Process



Note: In case the firmware type being downloaded is different from the earlier firmware (e.g., downloading a PB firmware on an EVK with PA firmware), the dialog box will display “Firmware/Configuration upgrade not completed. Refer Message window for details” as shown in Figure 4-7 instead of “Flash updated successfully”. This error message comes up because the new firmware which was written to flash is unable to start since the jumper settings have not yet been changed to support the new firmware. This error message displayed on the dialog box can be ignored as long as “Firmware/Configuration write to flash completed” message is seen in the message window of the EZ-PD Configuration Utility GUI as shown in Figure 4-7.

Figure 4-7. Downloading a different application firmware type



11. Configure the jumper settings as per the downloaded firmware requirements (PA / PB) and power cycle the CY4532 EVK to use the new firmware

4.1.2 Common Problems and Troubleshooting

#	Issue	Possible Cause	Possible Solution(s)
1	Unable to download firmware. UFP-AMA entry is not seen in Select target window of the EZ-PD Configuration Utility	Jumpers J2, J3, and J4 on the CY4532 EVK Main Board may not have been set correctly as per the existing firmware loaded on the EVK. Power may not have been supplied as per the existing firmware loaded on the EVK	Identify the existing application firmware type (PA/ PB) loaded on the CY4532 EVK using the procedure described in Appendix C , set the jumpers J2, J3, and J4 as per the application firmware type; and download the firmware again. Provide power using the correct supply (DC Power Adapter/ Battery) and position the Power Selection Switch (SW1) as per the power supply used

5. Kit Operation



This chapter describes how to configure the CY4532 EZ-PD CCG3PA EVK to demonstrate the functionality as a USB Type-C Power Adapter (PA) and a USB Type-C Power Bank (PB) applications. Two separate demonstrations are covered:

- Power Adapter (PA) Demo
- Power Bank (PB) Demo

Following is the list of USB Type-C and USB Type-A devices and power adapters which have been tested with CY4532 EVK

- USB Type-C devices
 - Apple MacBook Pro
 - LeEco Le Max 2 Phone
- USB Type-A devices
 - iPhone 6
 - iPad Air
 - Samsung Note 3
- USB Type-C Power Adapter
 - Apple 29W USB-C Power Adapter

It is recommended to use USB Type-A devices which are compliant to QC 3.0/ Apple Charging 2.4A/ Samsung AFC/ BC 1.2 charging protocols with the CY4532 EVK. Contact Cypress Technical Support through www.cypress.com/support for additional support if required.

In addition this chapter explains the procedure to use the CY4532 Power Board as a Programmer for an external hardware with a Cypress EZ-PD CCGx Product supporting CC bootloading feature.

5.1 Power Adapter (PA) Demo

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

- Providing power through the USB Type-C and USB Type-A interfaces simultaneously from an external supply

5.1.1 Boards, Cables, and Accessories Needed

The following items are needed to perform this demo:

- Items provided with the kit:
 - 12 V 24 W DC power adapter
 - CY4532 EZ-PD CCG3PA EVK boards (Power Board and Main Board)
- Items not provided with the kit:
 - Type-C device which can consume power over the USB Type-C (example: Laptop or Mobile Phone with USB Type-C port)
 - A device which can be charged by connecting to the USB Type-A interface (example: mobile phone which can be charged through the USB port)
 - USB cables to connect the devices to the Type-C and Type-A interfaces

5.1.2 Running the Power Adapter Demo

1. If the firmware has been changed from the default Power Adapter (PA) firmware, load the power adapter firmware first. See 4.1 for more details.
2. Set the jumpers on the CY4532 Main Board and Power Board as specified in the following table:

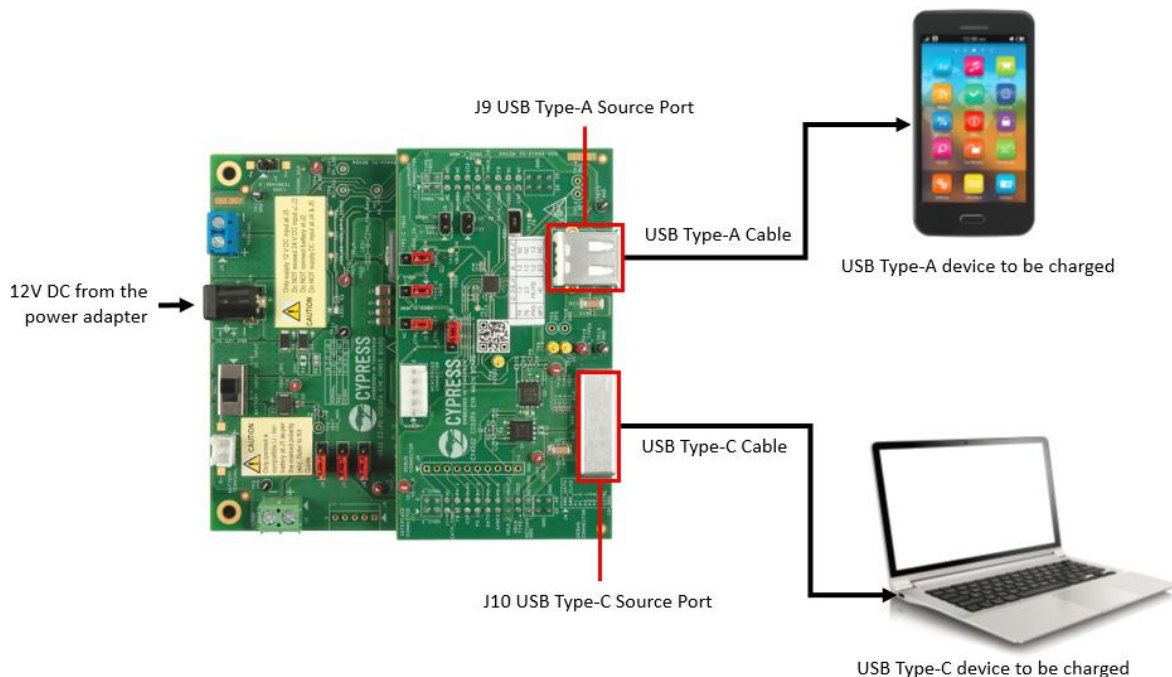
Table 5-1. CY4532 EVK Jumper Settings for the Power Adapter demo

Board Type	Jumper Header	Status
Main Board	J2	Short pins 1 and 2
	J3	
	J4	
	J6	
	J5	Open
	J7	
Power Board	J6	Short pins 1 and 2
	J7	
	J9	

Note: Figure 5-1 can also be used to identify the jumper settings.

3. Set the Input Power Selection Switch (SW1) on the Power Board in the 'DC INPUT' position.
4. Connect the 12 V DC power adapter provided with the kit to the CY4532 Power Board's power jack J3. The Power LED (LED1) on the CY4532 EVK Power Board blinks once to indicate that the kit is powered.

Figure 5-1. Setup for Power Adapter Demo



5. Connect a USB Type-C device to the Type-C port (J10) located on the Main Board. The Power LED (LED1) on the CY4532 EVK Power Board blinks once to indicate supply of power on J10.

Note: The voltage provided by the CY4532 EVK to the device is determined based on the USB PD contract negotiated between the CY4532 EVK and the device. The PA firmware supports 5V, 9V and 12V output. This voltage can be monitored at the VBUS_P test point (TP14) located on the Power Board.

6. Connect a USB Type-A device such as mobile phone on the Type-A receptacle (J9) to charge it.

Note: CY4532 supports simultaneous charging through the Type-C and Type-A ports. The voltage provided by the CY4532 kit to the device connected on the Type-A interface can be monitored at the SUPPLY_TYPE_A test point (TP12) on the Power Board.

7. Check the user feedback provided by the device (e.g., battery charging status on the display of a mobile phone) connected on the USB Type-C and/or Type-A interfaces to determine the charging status. Disconnect the device from CY4532 once charging is completed to the desired level.

5.1.3 Common Problems and Troubleshooting

#	Issue	Possible Cause	Possible Solution(s)
1	Type C/Type A device connected to the CY4532 is not getting charged.	Switch SW1 may not be at 'DC INPUT' position. CY4532 may not have been loaded with 'Power Adapter' firmware.	Set the Switch SW1 to 'DC INPUT' position. Download 'Power Adapter' firmware using the details provided in 4. .
2	The Power LED (LED1) does not blink when the DC power adapter is connected to the EVK.	Switch SW1 may not be at the 'DC INPUT' position. DC power adapter might have been re-plugged within three seconds after removing the same from the EVK.	Position the switch SW1 at the 'DC INPUT' position. Leave a minimum gap of three seconds between unplugging and re-plugging the DC power adapter.
3	The device that is connected to the USB Type-A port gets charged intermittently.	The device may implement a proprietary charging protocol instead of BC 1.2, QC 3.0, Apple Charging 2.4A, or Samsung AFC protocols.	CY4532 EVK supports charging using BC 1.2, QC 3.0, Apple Charging 2.4A and Samsung AFC protocols. Make sure that the device connected to CY4532 EVK is compliant to one of these protocols.
4	Unable to charge through the USB Type-C and USB Type-A ports simultaneously.	Note that the total power which can be provided to the devices is limited to 24 W with the DC adapter provided with the EVK.	Use another DC adapter with higher power output. CY4532 EVK can support up to 12 V, 5 A DC input at J3.
5	Device connected to the USB Type-C port does not get charged or stops charging.	CY4532 EVK implements Over-current Protection (OCP) for safety. This shuts down charging on the Type-C port if the current exceeds a certain limit. By default, this limit is set to 2 A.	Check if the device connected to the USB Type-C port can be configured to set the current consumption limit to 2 A.
6	Charging of the devices connected on the Type-C and Type-A ports goes through intermittent charging cycles before it stabilizes.	CY4532 EVK supports multiple charging protocols (QC, AFC, BC 1.2, Apple Charging 2.4A). The communication between the EVK and the device being charged to align on the optimal voltage and current settings can happen in steps.	None.

5.2 Power Bank (PB) Demo

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

- Charging a 1-cell or 2-cell Lithium-ion battery connected to the CY4532 EVK
- Providing power through the USB Type-C and USB Type-A ports of the CY4532 from a 1-cell or 2-cell Lithium-ion battery

5.2.1 Boards, Cables and Accessories Needed

The following items are needed to perform this demo:

- Items provided with the kit:
 - CY4532 EZ-PD CCG3PA EVK boards (Power Board and Main Board)
- Items not provided with the kit:
 - An USB Type-C device that can consume power over Type-C (example: laptop or mobile phone with Type-C port)
 - A USB Type-C Power Adapter to charge the battery
 - A device which can be charged by connecting to USB Type-A interface (example: mobile phone which can be charged through the USB port)
 - A 1-cell or 2-cell Lithium-ion battery

- USB cables to connect the devices to the Type-C and Type-A interfaces

5.2.2 Running the Power Bank Demo

5.2.2.1 Charging the battery attached to the CY4532 EVK

1. Program the latest Power Bank (PB) firmware into the kit. See 4.1 for details.

Note: By default CY4532 EVK is configured for supporting 2-cell battery. Refer [Appendix B](#) to configure the EVK for 1-cell battery operation

2. Remove the power supply connected on the DC Jack (J3).
3. Set the jumpers on the CY4532 Main Board and Power Board as specified in the following table:

Table 5-2. CY4532 EVK Jumper Settings for the Power Bank demo

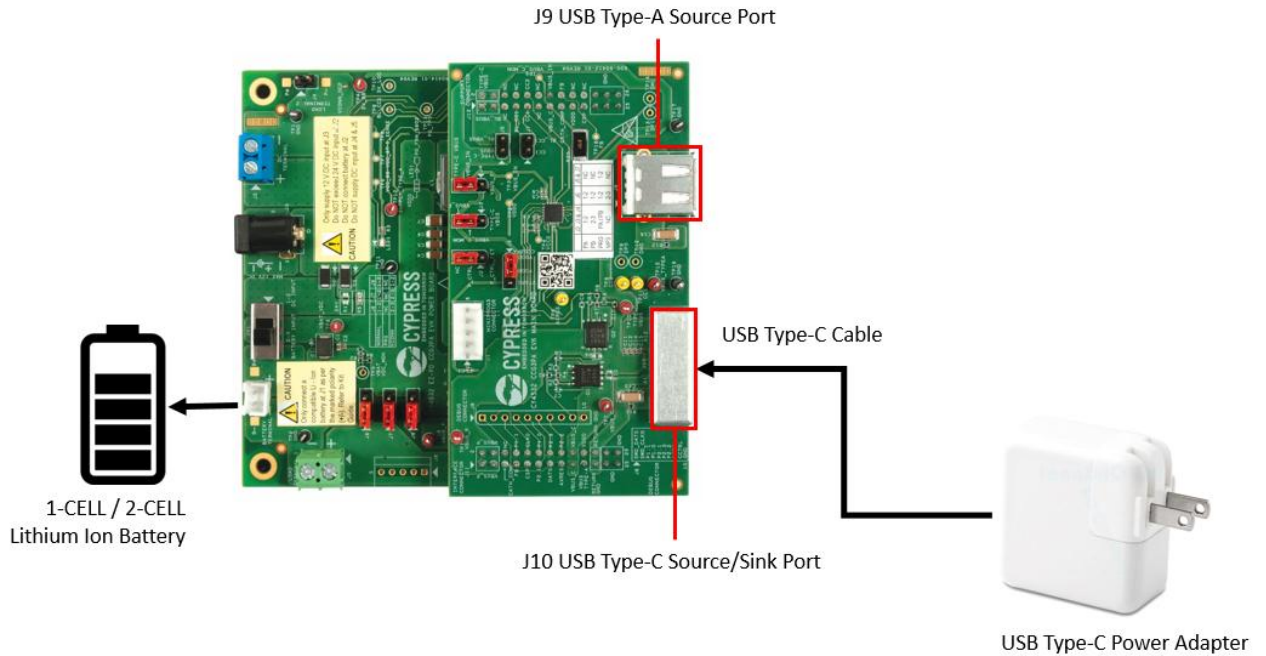
Board Type	Jumper Header	Status
Main Board	J2	Short pins 2 and 3
	J3	
	J4	
	J6	Short pins 1 and 2
	J5	Open
	J7	
Power Board	J6	Short pins 1 and 2
	J7	
	J9	

Note: [Figure 5-2](#) can also be used to identify the jumper settings.

4. Connect a 2-cell Lithium-ion battery to the battery terminal (J1).
IMPORTANT NOTE: Make sure that the battery terminals are connected to the CY4532 Power Board as per the positive (+) and negative (-) terminals marked on the Power Board. Alternatively, the battery terminals can be soldered on the B+ and B- pads which are located around J1 as per the marked polarity.
5. Position Input Power Selection Switch (SW1) on the Power Board to the 'Battery Input' position. The Power LED (LED1) on the CY4532 EVK Power Board blinks once if the battery has required charge to power the EVK.
6. Connect a USB Type-C Power Adapter on the USB Type-C port (J10) of the CY4532 Main Board.

IMPORTANT NOTE: The USB Type-C Power Adapter should not be connected to the USB Type-C port (J13) located on the CY4532 Power Board. This port (J13) is meant for using the CY4532 EVK Power Board as an external programmer with Cypress EZ-PD products supporting CC bootloading feature. Refer to Section 5.3 for more details.

Figure 5-2. Setup for Charging a Battery Attached to CY4532 EVK



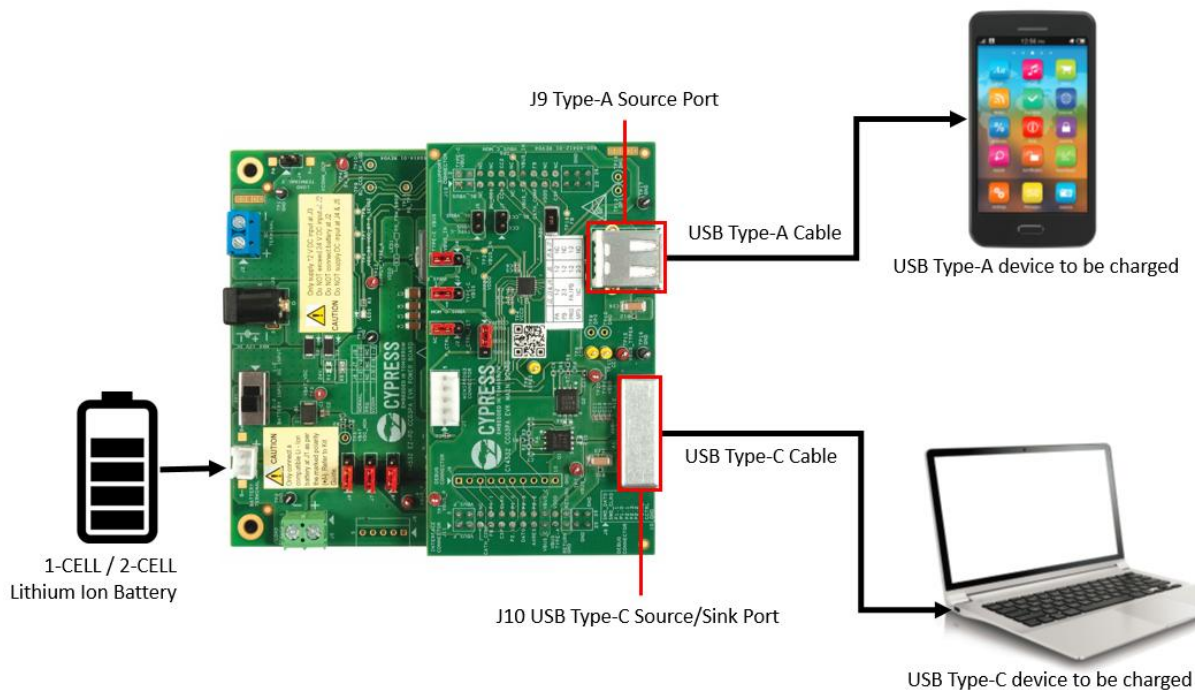
7. Verify that LED1 on the Power Board is glowing green continuously which indicates charging of the battery.

Note: While the battery is being charged using the USB Type-C Power Adapter, a USB Type-A device such as a mobile phone can be charged by connecting it to the USB Type-A port.

5.2.2.2 Providing power on USB Type-C and USB Type-A ports

1. Disconnect the USB Type-C power adapter from the CY4532 EVK Main Board. The Power LED (LED1) stops glowing.
2. Connect a USB Type-C device that needs to be charged to the Type-C port (J10) located on the Main Board. The Power LED (LED1) on the CY4532 EVK Power Board blinks once to indicate supply of power on J10.

Figure 5-3. Setup for Providing Power on USB Type-C and USB Type-A Ports



Note 1: Make sure that the charged Lithium-ion battery is connected to the battery terminal (J1) and switch SW1 is at 'BATTERY INPUT' position before connecting the USB Type-C device for charging. If the battery gets connected after the USB Type-C device is connected, the USB Type-C device can end up charging the Lithium-ion battery.

Note 2: The voltage provided by the CY4532 EVK to the device is determined based on the USB PD contract negotiated between the CY4532 EVK and the device. This voltage can be monitored at the VBUS_P test point (TP14) located on the Power Board.

Note 3: A USB Type-A device also can be connected to the USB Type-C port (J10) for charging using a USB Type-C to Type-A converter.

3. Connect a USB Type-A device such as a mobile phone on the USB Type-A port to charge it.

Note: CY4532 supports simultaneous charging through the USB Type-C and USB Type-A ports. The voltage provided by the CY4532 EVK to the device connected on the Type-A port can be monitored at the SUPPLY_TYPE_A test point (TP12) on the Power Board.
4. Check the user feedback provided by the device connected on the USB Type-C and/or Type-A interfaces to determine the charging status. Disconnect the devices from the CY4532 EVK once charging is completed to the desired level.

Note: If CY4532 is no longer providing power through the USB Type-C and/or Type-A ports, the Lithium-ion battery connected to the EVK may require charging again. Repeat the steps specified in [Charging the battery attached to the CY4532 EVK](#) section to charge the battery.

5.2.3 Common Problems and Troubleshooting

#	Issue	Possible Cause	Possible Solution(s)
1	USB Type C/Type A device connected to CY4532 is not getting charged.	Switch SW1 may not be in the 'BATTERY INPUT' position. CY4532 may not have been loaded with 'Power Bank' firmware.	Set the Switch SW1 at 'BATTERY INPUT' position. Download 'Power Bank' firmware using the details provided in 4. .
2	The Power LED (LED1) does not blink when SW1 is positioned at the 'BATTERY INPUT' position after connecting the battery.	The battery may not have adequate charge to power the EVK. The battery might have been connected to the EVK within three seconds after removing the same from the EVK (using the SW1 switch).	Charge the battery by connecting a USB Type-C Power Adapter on the Type-C port (J10) of the CY4532 Main Board. Leave a minimum gap of three seconds between consecutive connections of the battery to the EVK.
3	The battery is not getting charged after connecting the USB Type-C Power Adapter.	Jumper settings on the Main Board and Power Board may not be set for Power Bank application. The USB Type-C Power Adapter might have been connected to the USB Type-C port (J13) located on the CY4532 Power Board. The battery type (1-Cell/ 2-Cell) configured on the CY4532 EVK hardware and firmware may not match with the type of battery (1-Cell/ 2-Cell) connected to the EVK.	Ensure that the jumpers on Main Board and Power Board are set for Power Bank application. Ensure that the USB Type-C Power Adapter is connected to the USB Type-C port (J10) located on the CY4532 Main Board. Configure the EVK hardware and firmware to match with the type of battery used. Refer to Appendix B for details.
4	The device connected to the USB Type-A port gets charged intermittently.	The device may implement a proprietary charging protocol instead of BC 1.2, QC 3.0, Apple Charging 2.4A, Samsung AFC protocols.	CY4532 EVK supports charging using BC 1.2, QC 3.0, Apple Charging 2.4A, and Samsung AFC protocols. Make sure that the device connected to CY4532 EVK is compliant to one of these protocols.
5	Unable to charge through the USB Type-C and USB Type-A ports simultaneously.	The output from the Li-Ion battery connected to the EVK may not be adequate to supply the required power to the devices connected to both the ports.	Use a battery with a higher output rating. CY4532 EVK can support 2-cell batteries with rating up to 8.4 V, 5 A.
6	Charging of the devices connected on the Type-C and Type-A ports goes through intermittent charging cycles before it stabilizes.	CY4532 EVK supports multiple charging protocols (QC, AFC, BC 1.2, Apple Charging 2.4A). The communication between the EVK and the device being charged to align on the optimal voltage and current settings can happen in steps.	None.
7	Type device connected to the USB Type-C ports does not get charged or stops charging.	The CY4532 EVK implements Over-current Protection (OCP) for safety reason. This shuts down charging on Type-C port of the current exceeds a certain limit. By default this limit is set to 2 A.	Check if the device connected to the USB Type-C port can be configured to set the current consumption limit to 2 A.

5.3 Using the CY4532 Power Board as a Programmer

The procedure described below explains using the CY4532 Power Board as a Programmer for external hardware with a Cypress EZ-PD CCGx Product supporting the CC bootloading feature. This feature is implemented using the CCG4 controller located on the CY4532 EVK Power Board.

5.3.1 Boards, Cables and Accessories Needed

The following items are needed to use the CY4532 Power Board as a Programmer:

- Items provided with the kit:
 - CY4532 Power Board
 - 12 V 24 W DC power adapter

- Items not provided with the kit:
 - Hardware with Cypress EZ-PD CCGx product supporting CC bootloading feature
 - A USB Type-C Electronically Marked Cable Assembly (EMCA) cable
 - A USB Mini-B Cable
 - PC/Laptop installed with the Cypress EZ-PD Configuration Utility

Note: The CY4532 kit Installer installs the EZ-PD Configuration Utility by default.

5.3.2 Using the CY4532 Power Board as a Programmer

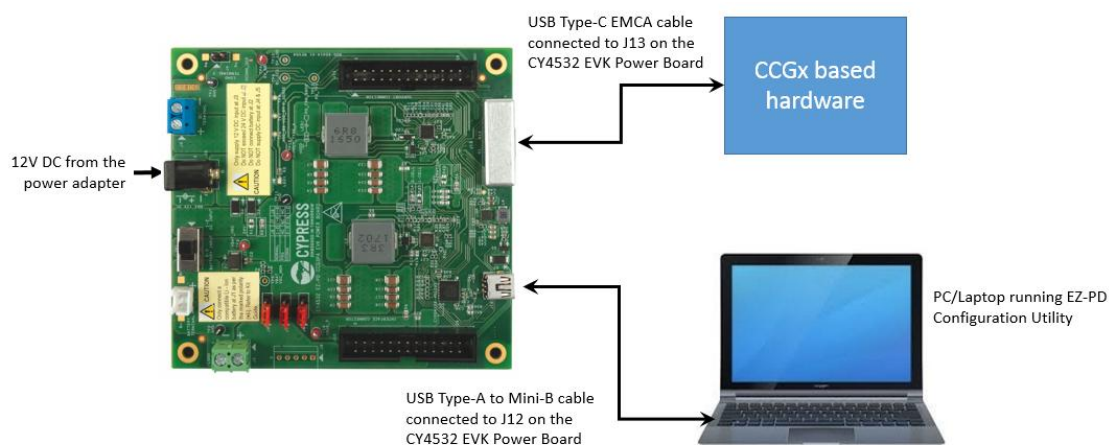
1. Remove the power supply connected on the DC Jack (J3) of the CY4532 Power Board.
2. Detach the CY4532 Main Board pre-mounted on top of the CY4532 Power Board.

Note 1: To remove the CY4532 Main Board, it is recommended to hold it around the longer edges of the board and lift it up.

Note 2: No specific jumper setting are required on the CY4532 Power Board to use it as a Programmer

3. Connect a USB Type-C EMCA cable between the USB Type-C port (J13) of the CY4532 Power Board and the USB Type-C port on the external hardware
4. Connect the USB Mini-B cable between the USB Mini-B port (J12) of CY4532 Power Board and a USB Type-A port of the PC/laptop

Figure 5-4. Setup for using CY4532 Power Board as Programmer



5. Connect the 12 V DC power adapter provided with the kit to the CY4532 Power Board's DC Jack (J3).
6. Set the Switch (SW1) on the Power Board to the 'DC INPUT' position.
8. Invoke the EZ-PD Configuration Utility on the PC/laptop and follow the programming procedure described in the User Manual of the utility. The User Manual can be invoked by clicking Help > **User Manual** on the GUI of the utility.

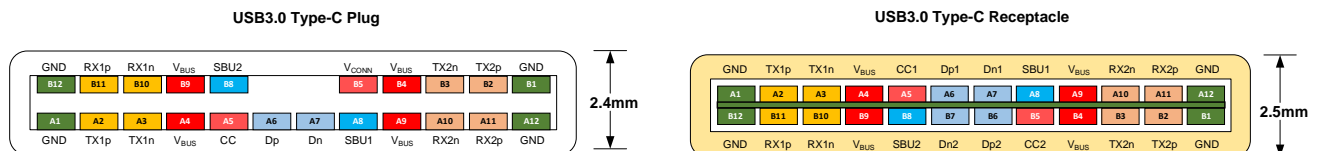
A. Terminology



Terminology

This guide assumes that the user of the CY4532 EZ-PD CCG3PA EVK is familiar with the fundamentals of the 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.



- **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 can be increased up to 20 V on USB PD systems.
- **VCONN:** A USB Type-C bus wire used to power the IC in the EMCA.

B. Configuring CY4532 EVK for 1-Cell or 2-Cell Li-Ion Battery Operation



1-Cell Lithium-ion batteries support an operating voltage range of 2.7 V to 4.2 V while 2-Cell batteries support an operating voltage range of 5.4 V to 8.4 V. CY4532 EVK hardware and firmware are configured by default to support 2-Cell battery operation. Configuring the EVK for 1-Cell battery operation requires updating the hardware and firmware configuration settings as described below.

Hardware Update for 1-Cell Battery Operation

1. Remove the power supply or the battery connected to the CY4532 EVK.
2. Detach the CY4532 Main Board from the CY4532 Power Board

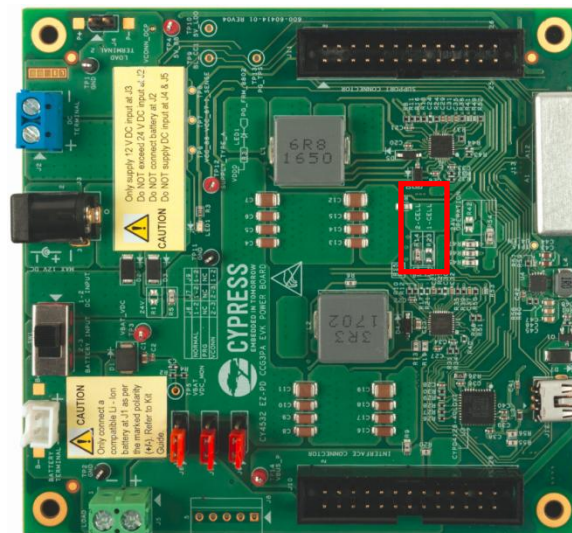
Note: To remove the CY4532 Main Board, it is recommended to hold it around the longer edges of the board and lift it up.

3. De-populate the 0 Ohm resistor located at R14 and populate the same at R23.

Note: In case a new resistor is populated at R23, make sure that it meets the following specification:

0.0 OHM, 0603 Package, 22.4 A Current Rating

Figure B-1. Hardware Configuration for 1-Cell and 2-Cell Battery Operation



4. Mount the CY4532 Main Board on the CY4532 Power Board.
5. The hardware is now ready for 1-cell battery operation.

Note: To switch from 1-cell battery configuration to 2-cell battery configuration (factory default state), de-populate the resistor from R23 to populate the same at R14.

Firmware Configuration Update for 1-Cell Battery Operation

Make sure to download the Power Bank application firmware using the procedure described in Chapter 5 before updating the firmware configuration for 1-cell battery.

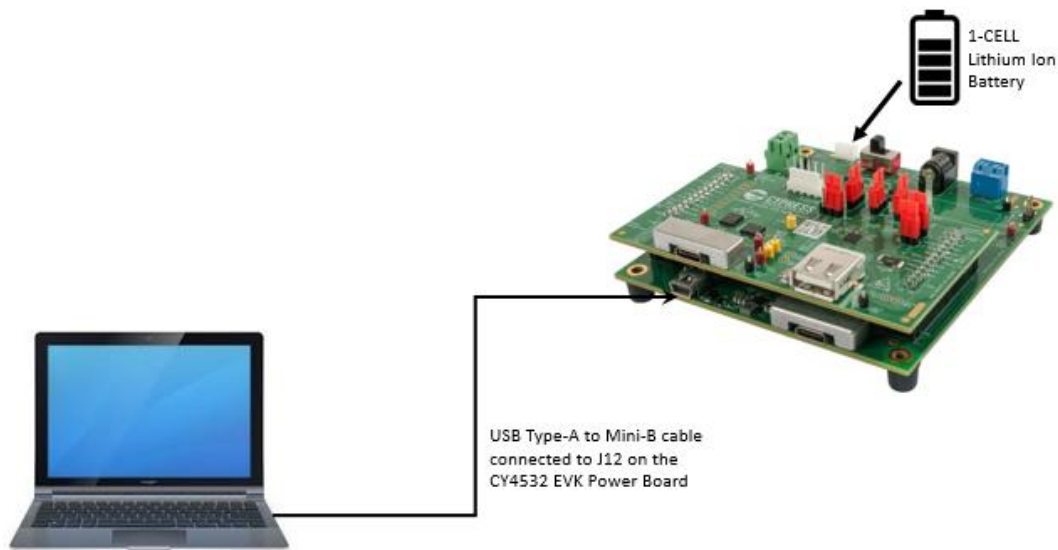
1. Set the jumpers on the CY4532 Main Board and Power Board as follows:

Table B-1. CY4532 EVK Jumper Settings for the configuring the battery type

Board Type	Jumper Header	Status
Main Board	J2	Short 2 and 3
	J3	
	J4	
	J6	Short 1 and 2
	J5	
	J7	
Power Board	J6	Open
	J7	
	J9	

2. Power the CY4532 EVK using a 1-Cell battery to the battery terminal (J1).
3. Connect the USB Type-A to Mini-B cable from the host PC to the J12 connector on the Power Board as shown in Figure B-2.

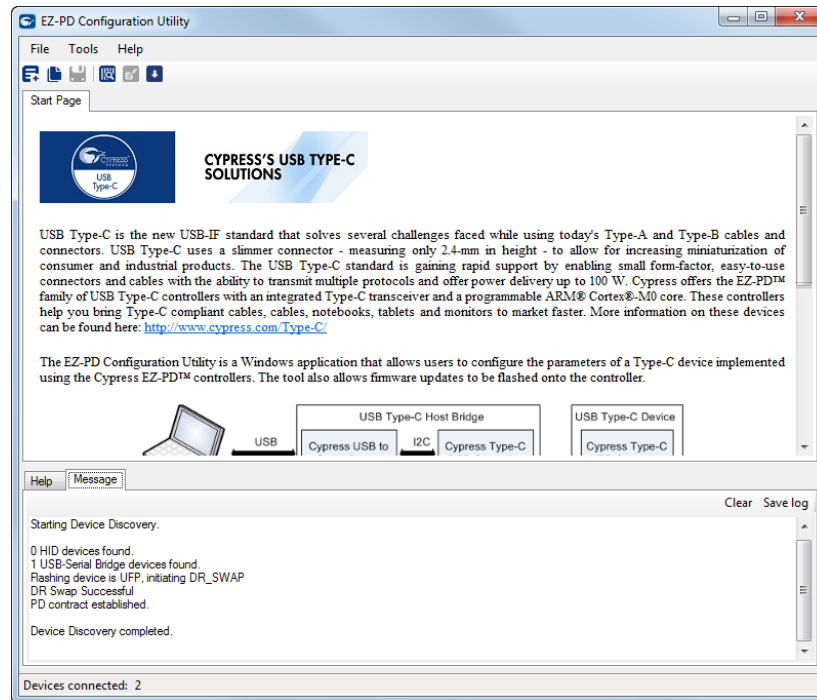
Figure B-2. Set-up for Configuring Firmware Settings on CY4532 EVK



4. Launch the EZ-PD Configuration Utility as shown in Figure B-3. The EZ-PD Configuration Utility is available at the following location by default:

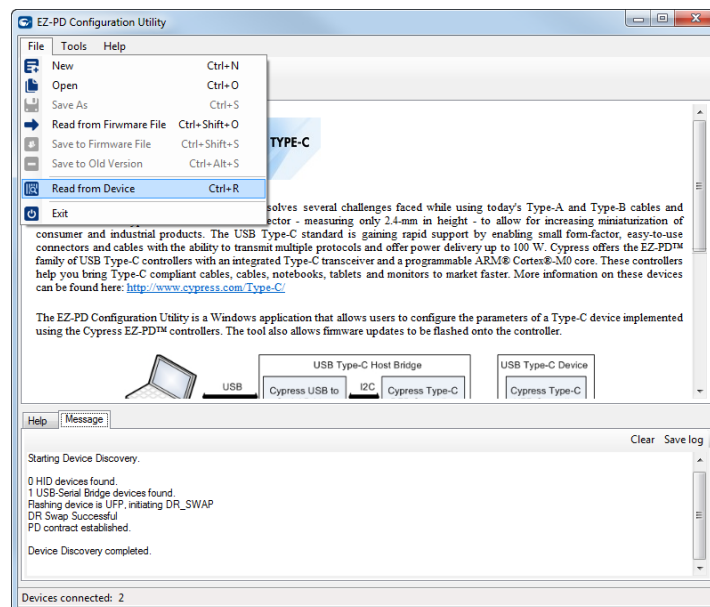
Windows > Start > All Programs > Cypress > EZ-PD Configuration Utility > EZ-PD Configuration Utility

Figure B-3. EZ-PD Configuration Utility



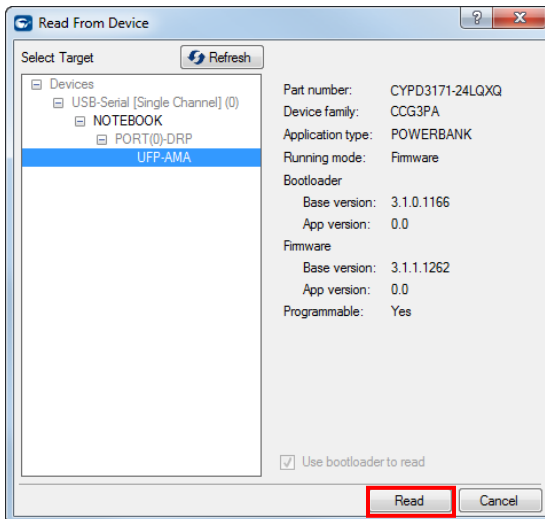
5. Select **File > Read from Device** as shown in Figure B-4. Refer to the [EZ-PD Configuration Utility User Manual](#) for more details. That document can also be opened by clicking **Help > User Manual** in the EZ-PD Configuration Utility.

Figure B-4. Invoking Read from Device Menu Item



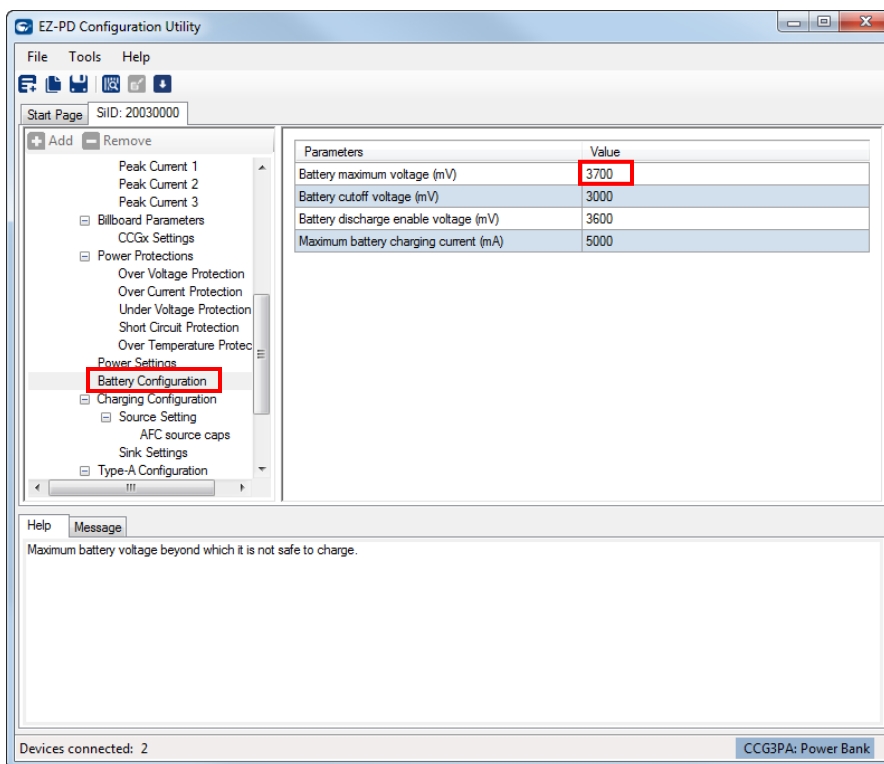
6. Select **UFP-AMA** from the Read from Device dialog box and click on **Read** button as shown in Figure B-5.

Figure B-5. Reading the Current Firmware Settings



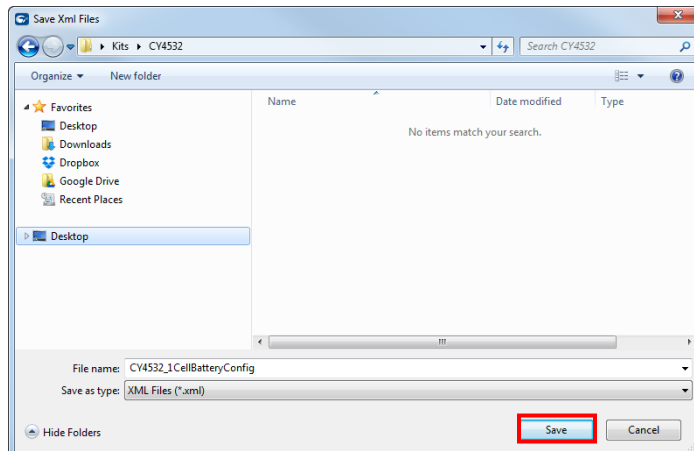
7. Select **Battery Configuration** from the firmware configuration settings and change the value for **Battery maximum voltage (mV)** to match with the voltage rating of the 1-Cell battery being used as shown in Figure B-6. The typical voltage rating of 1-Cell battery is 3700 mV.

Figure B-6. Updating Battery Configuration



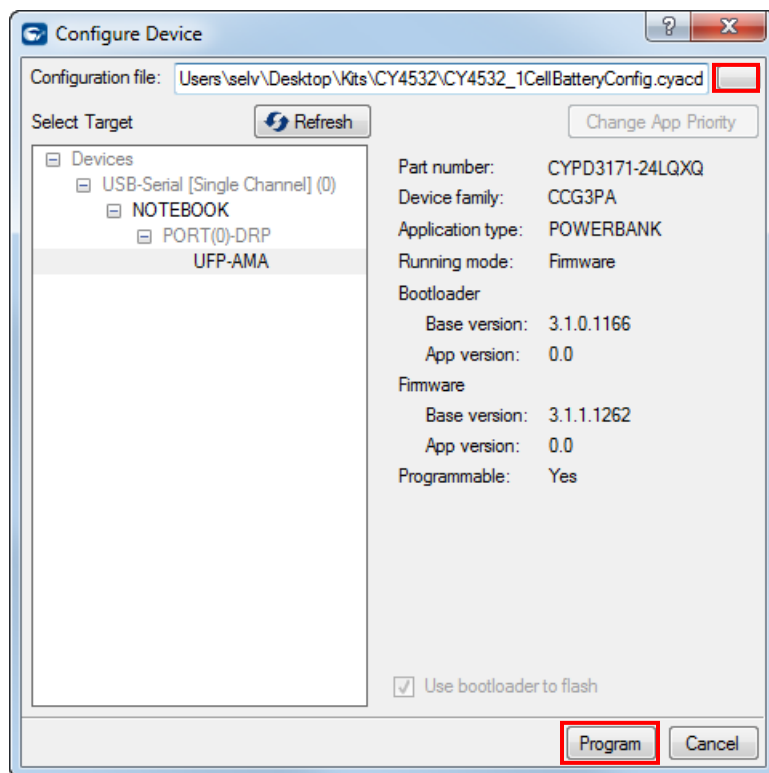
8. Select **File > Save As** and specify a path to store the updated firmware settings in a .xml file as shown in Figure B-7.

Figure B-7. Saving Updated Firmware Settings



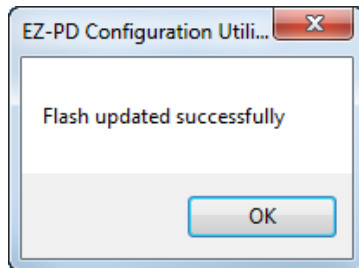
9. Select **Tools > Configure Device**. Specify path for the firmware settings file (.xml), select **UFP-AMA** as the target and click **Program** in the Configure Device dialog box as shown in Figure B-8.

Figure B-8. Downloading the Firmware Settings



10. Upon successful completion of the firmware settings update process, a window with the message “Flash updated successfully” is displayed as shown in Figure B-9. Click **OK**.

Figure B-9. Configuration of Firmware Settings Update Process



11. Power OFF the CY4532 EVK by removing the battery.
12. Set the jumpers on the CY4532 Main Board and Power Board as follows:

Table B-2. CY4532 EVK Jumper Settings for the Power Bank application

Board Type	Jumper Header	Status
Main Board	J2	Short pins 2 and 3
	J3	
	J4	
	J6	Short pins 1 and 2
	J5	Open
	J7	
Power Board	J6	Short pins 1 and 2
	J7	
	J9	

13. Connect a 1-Cell battery to the EVK and start the usage.

Note: To switch from 1-cell battery configuration to 2-cell battery configuration (factory default state), repeat the above mentioned steps 1 to 9 and use a value of 8000 mV for **Battery maximum voltage** in step 5. Also use a 2-cell battery to power the EVK instead of 1-cell battery.

C. Identifying the Application Firmware Type



Follow the instructions given below to identify the application firmware type (PA / PB) loaded on the CY4532 EVK.

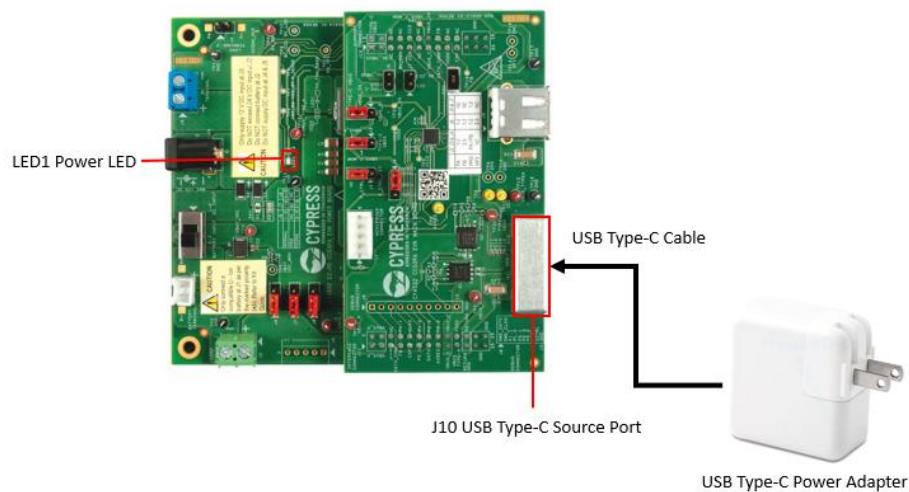
1. Remove the power supply connected to the DC Jack (J3) of the CY4532 EVK Power Board.
2. Position Input Power Selection Switch (SW1) on the Power Board to the 'Battery Input' position
3. Set the jumpers on the CY4532 EVK Main Board and Power Board as specified in the following table:

Table C-1. Jumper Settings to Identify the Application Firmware Type

Board Type	Jumper Header	Status
Main Board	J2	Short pins 2 and 3
	J3	
	J4	
	J6	Short pins 1 and 2
	J5	Open
	J7	
Power Board	J6	Short pins 1 and 2
	J7	
	J9	

4. Connect a USB Type-C Power Adapter to the USB Type-C port (J10) on the CY4532 EVK Main Board.

Figure C-1. Setup to Identify the Application Firmware Type



5. Check the Power LED (LED1) on the Power Board. If it is blinking rapidly, the firmware loaded on the EVK is PB firmware; otherwise it is PA firmware.

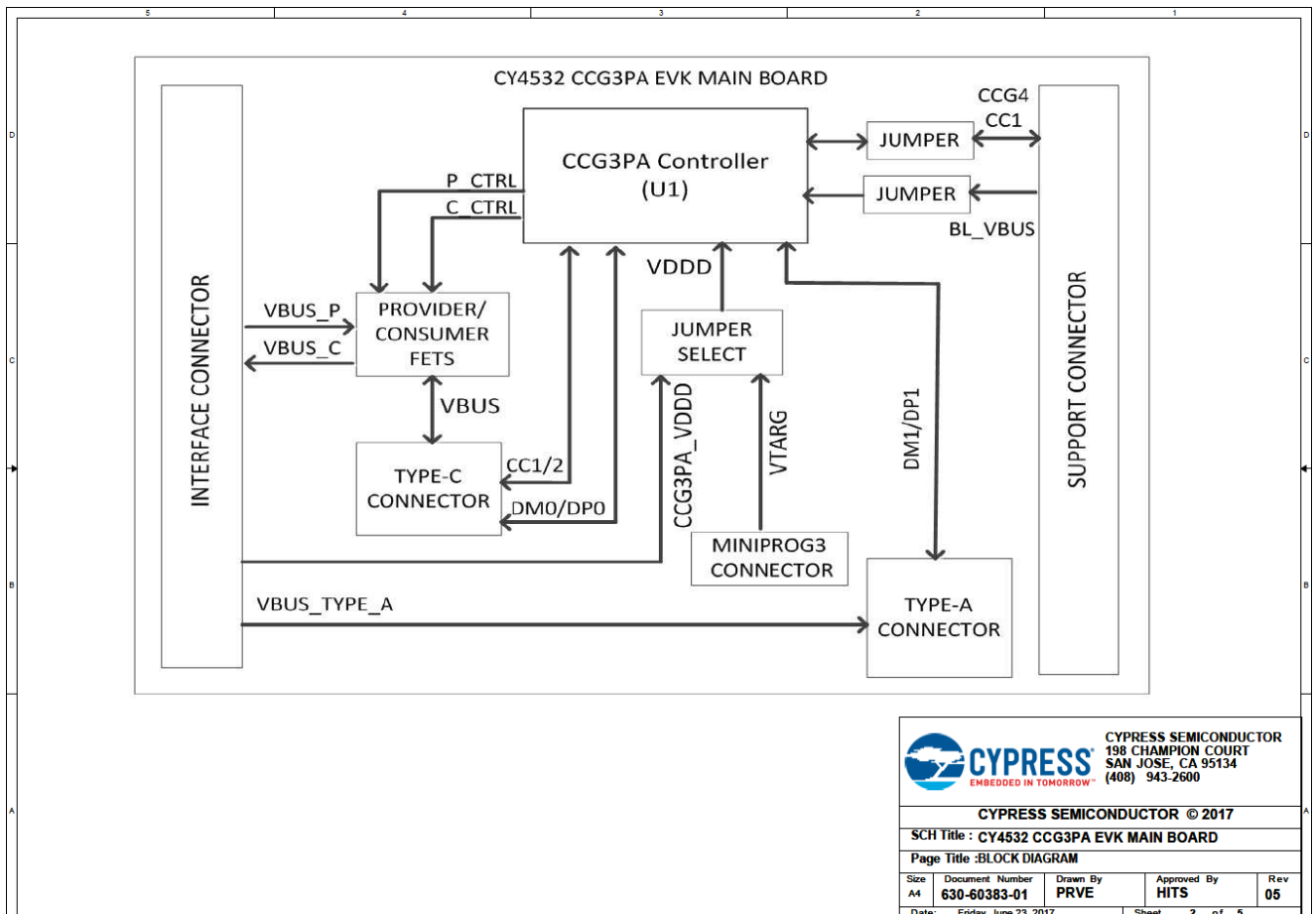
D. CY4532 Schematics and Bill Of Material (BoM)

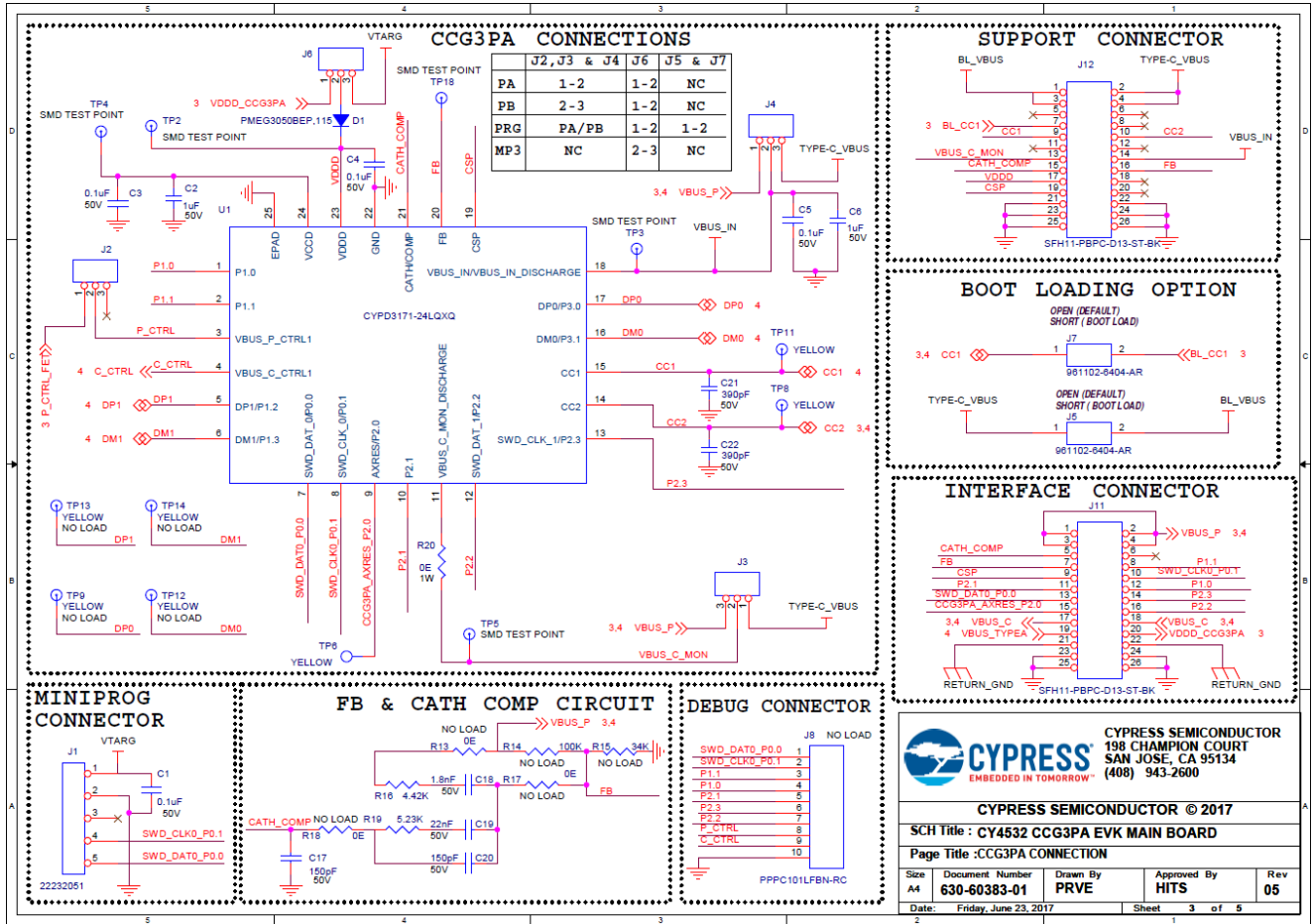


The CY4532 hardware design files are available under <Install Directory>\CY4532 EZ-PD CCG3PA EVK\1.0\Hardware\.

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.

CY4532 EVK Main Board Schematics





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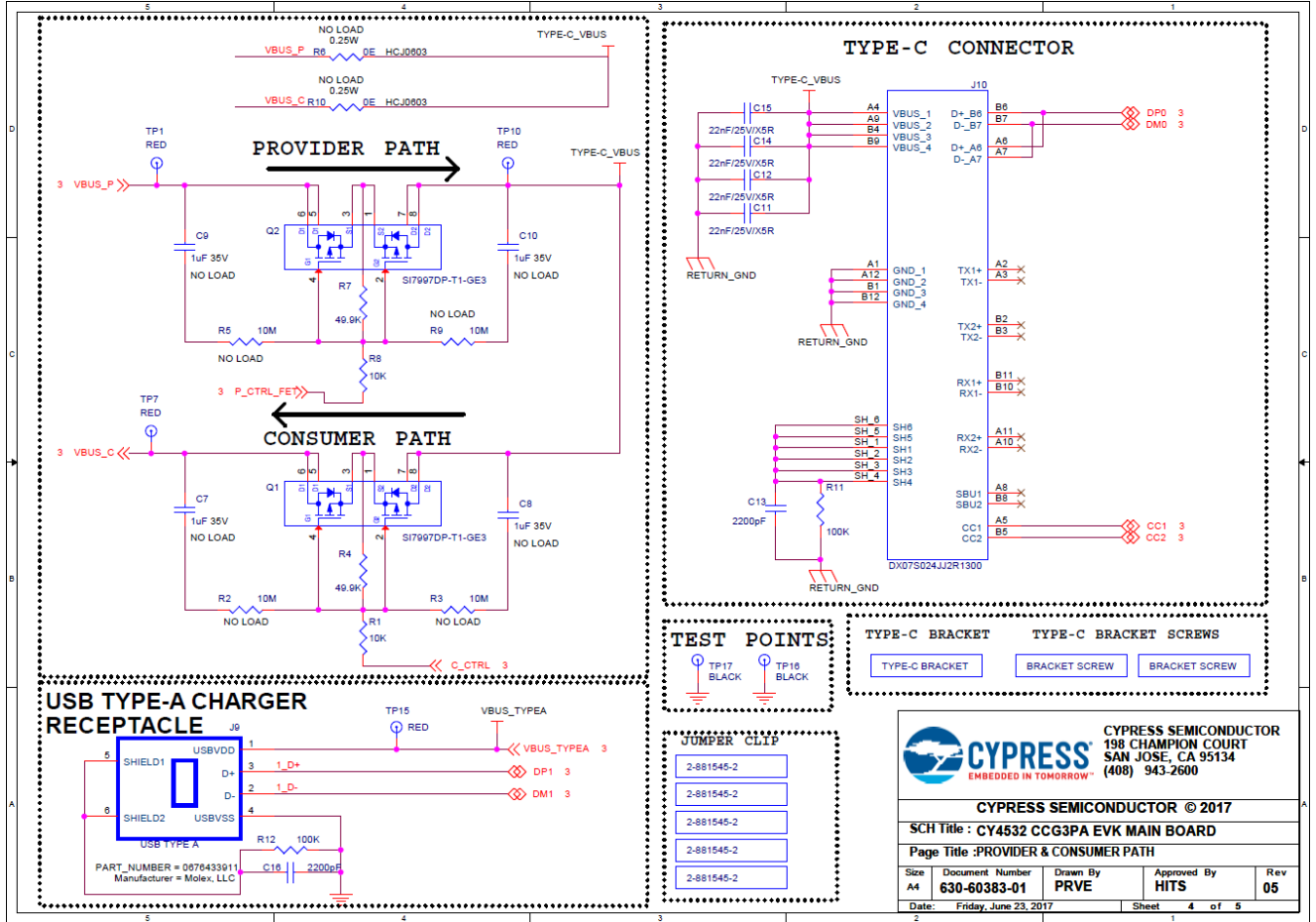
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SCH Title : CY4532 CCG3PA EVK MAIN BOARD

Page Title : CCG3PA CONNECTION

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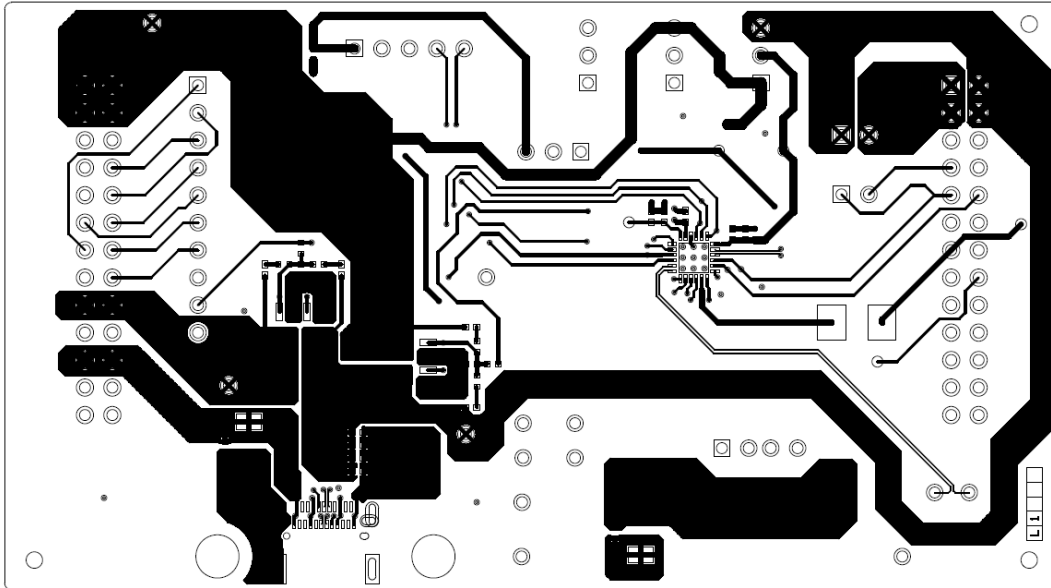
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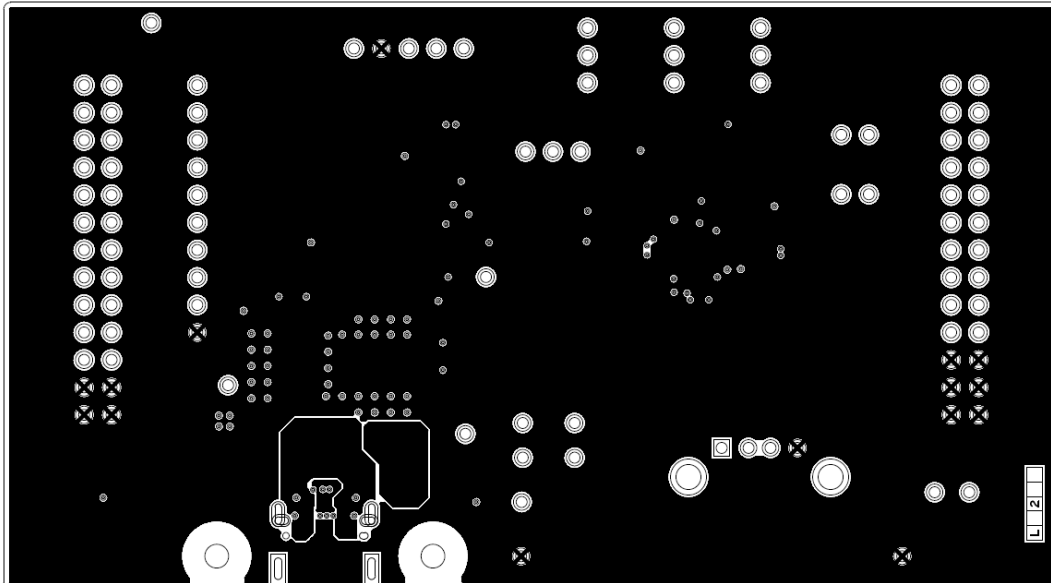
CY4532 EVK Main Board BoM

#	Qty	Reference	Value	Description	Manufacturer	Mfr Part #
1	4	C1,C3,C4,C5	0.1uF	CAP CER 0.1UF 50V X7R 0402	TDK Corporation	C1005X7R1H104K050BB
2	2	C2,C6	1uF	CAP CER 1UF 35V X5R 0402	TDK Corporation	C1005X5R1V105K050BC
3	4	C11,C12,C14,C15	22nF/25V/X5R	CAP CER 0.022UF 25V X5R 0402	TDK CORPORATION	C1005X5R1E223K050BA
4	2	C13,C16	2200pF	CAP CER 2200PF 2KV 10% X7R 1808	JOHANSON	202R29W222KV4E
5	2	C17,C20	150pF	CAP CER 150PF 50V NP0 0402	Murata Electronics North America	GRM1555C1H151JA01D
6	1	C18	1.8nF	CAP CER 1800PF 50V X7R 0402	Murata Electronics North America	GRM155R71H182KA01D
7	1	C19	22nF	CAP CER 0.022UF 50V X7R 0402	Murata Electronics North America	GRM155R71H223KA12J
8	2	C21,C22	390pF	CAP CER 390PF 50V C0G 0402	TDK	C1005C0G1H391K050BA
9	1	D1	PMEG3050BEP, 115	DIODE SCHOTTKY 30V 5A SOD128	NXP Semiconductors	PMEG3050BEP,115
10	1	J1	22232051	CONN HEADER 5POS .100 VERT TIN	Molex, LLC	22232051
11	4	J2,J3,J4,J6	CON3	CONN HEADER .100" SNGL STR 3POS	Sullins Connector Solutions	PRPC003SAAN-RC
12	2	J5,J7	961102-6404-AR	CONN HEADER VERT SGL 2POS GOLD	3M	961102-6404-AR
13	1	J9	USB TYPE A	CONN RCPT USB R/A TYPE A 4POS	Molex, LLC	676433911
14	1	J10	DX07S024JJ2R1300	CONN RCPT USB3.1 TYPEC SMD R/A	JAE Electronics	DX07S024JJ2R1300
15	2	J11,J12	SFH11-PBPC-D13-ST-BK	26 Position Header Connector 0.100" (2.54mm) Through Hole Gold	Sullins Connector Solutions	SFH11-PBPC-D13-ST-BK
16	2	Q1,Q2	SI7997DP-T1-GE3	MOSFET 2P-CH 30V 60A PPAK SO-8	Vishay Siliconix	SI7997DP-T1-GE3
17	2	R1,R8	10K	RES 10K OHM 1/16W 1% 0402	Samsung Electro-Mechanics America, Inc	RC1005F103CS
18	2	R4,R7	49.9K	RES SMD 49.9K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF4992X
19	2	R11,R12	100K	RES SMD 100K OHM 1% 1/16W 0402	Yageo	RC0402FR-07100KL
20	1	R16	4.42K	RES SMD 4.42K OHM 1% 1/10W 0603	Yageo	RC0603FR-074K42L
21	1	R19	5.23K	RES SMD 5.23K OHM 1% 1/10W 0603	Yageo	RC0603FR-075K23L
22	1	R20	OE	RES SMD 0.0 OHM JUMPER 1W 2512	StackPole Electronics	RMCF2512ZT0R00
23	4	TP1,TP7,TP10,TP15	RED	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000
24	3	TP6,TP8,TP11	YELLOW	TEST POINT PC MINI .040"D YELLOW	Keystone Electronics	5004
25	2	TP16,TP17	BLACK	TEST POINT PC MINI .040"D BLACK	Keystone Electronics	5001
26	1	U1	CYPD3171-24LQXQ	USB Type-C Port Controller	Cypress Semiconductor	CYPD3171-24LQXQ

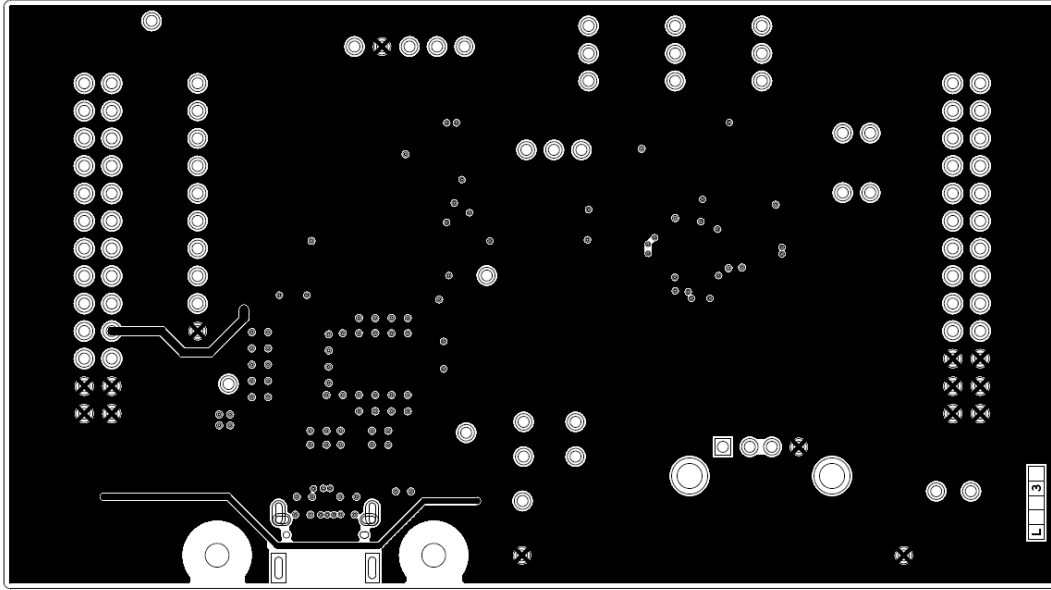
CY4532 EVK Main Board Layout



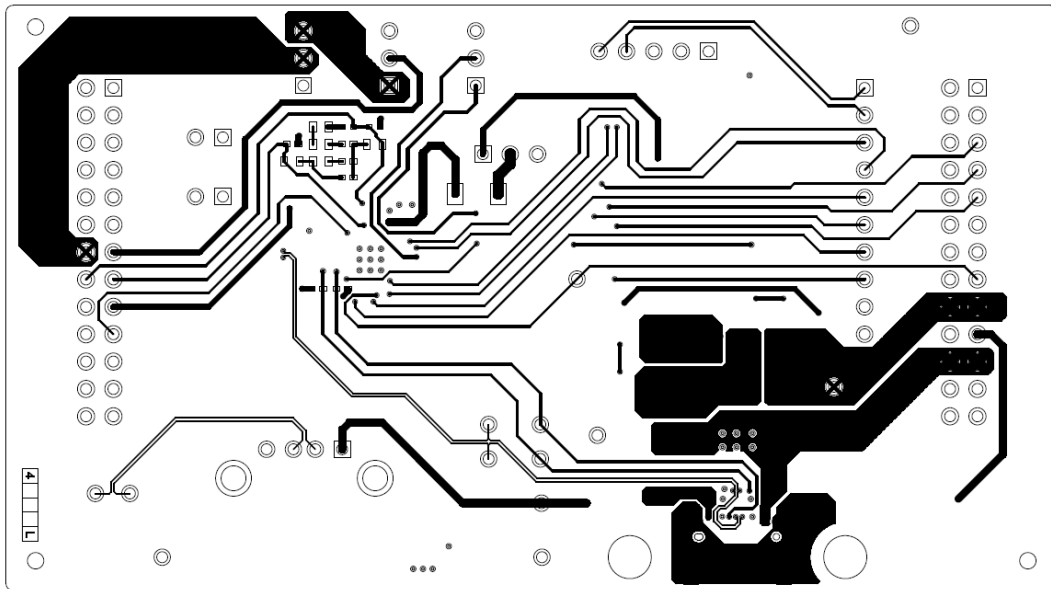
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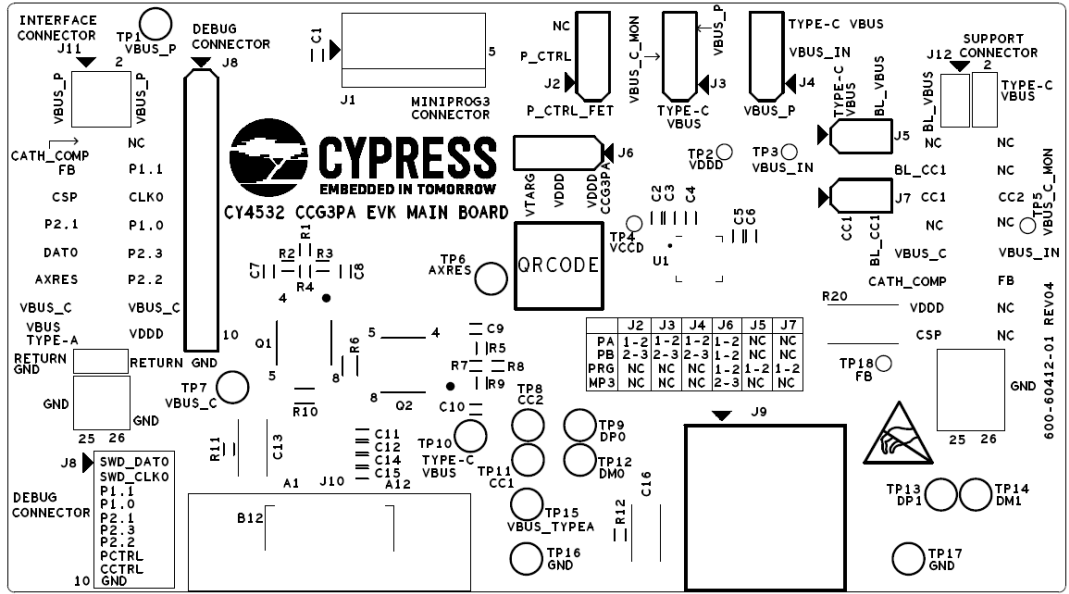
600-60412-01 REV04 GROUND1 LAYER



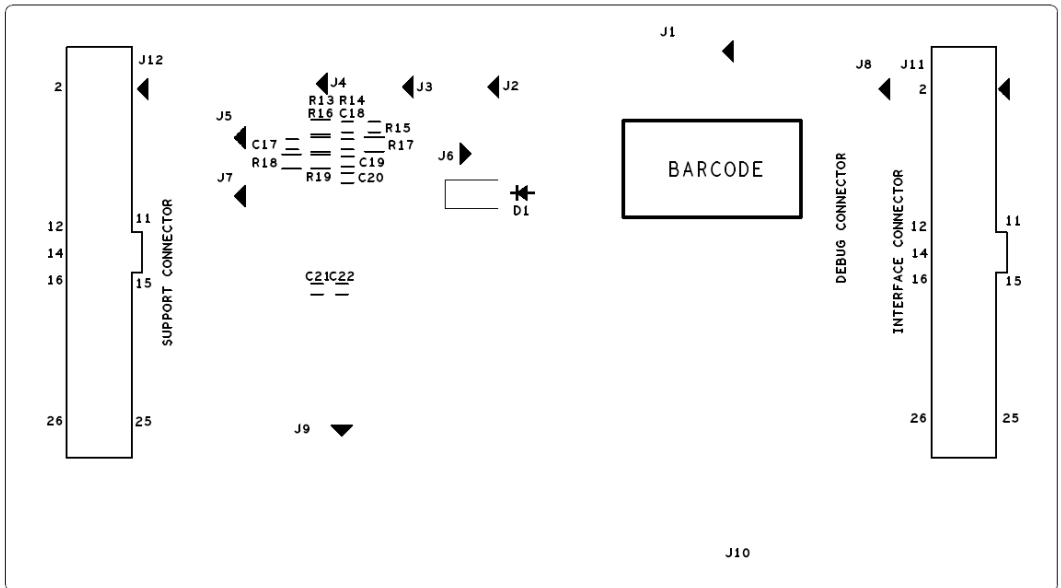
600-60412-01 REV04 GROUND2 LAYER



600-60412-01 REV04 SECONDARY SIDE

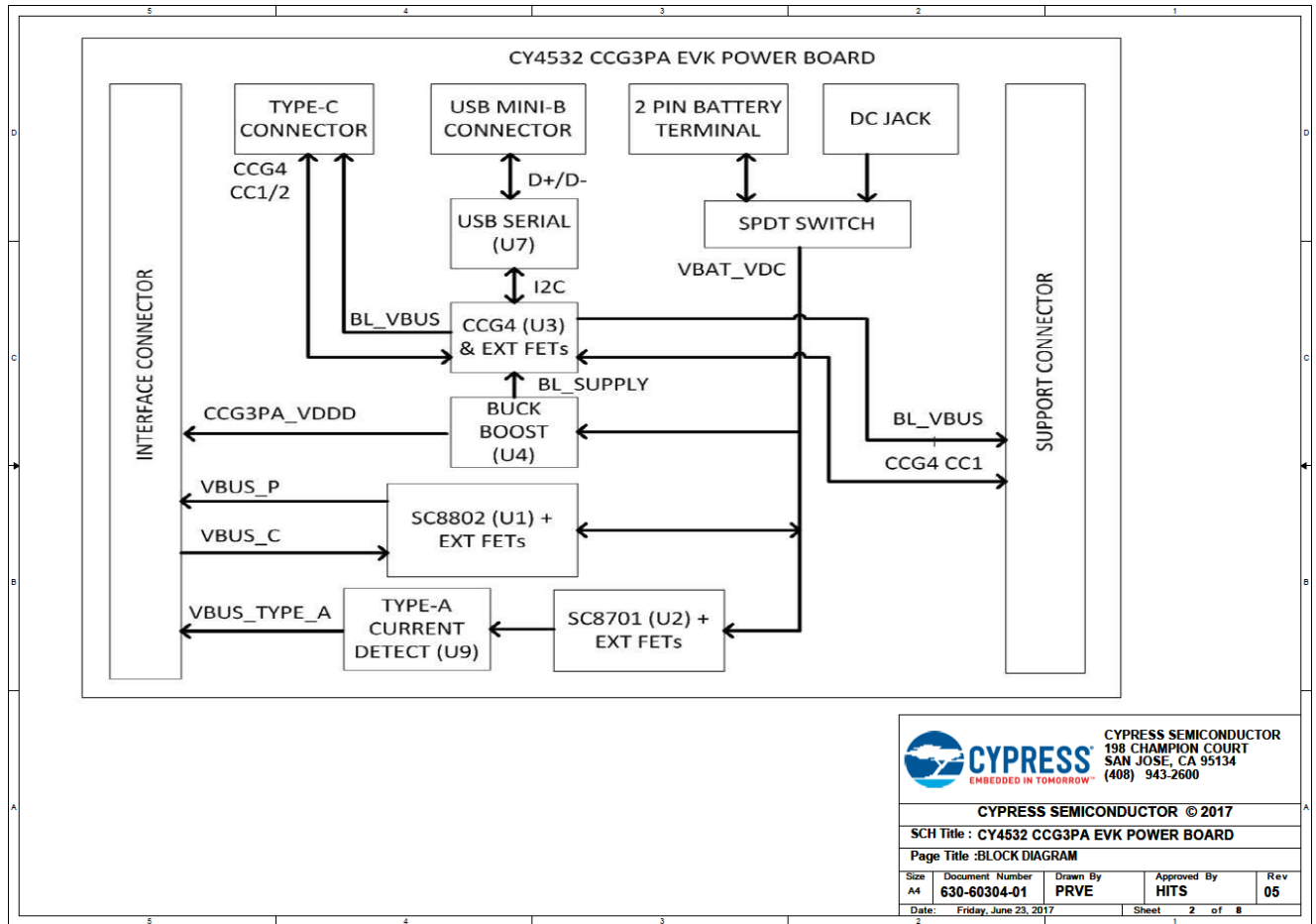


600-60412-01 REV04 PRIMARY SILKSCREEN



600-60412-01 REV04 SECONDARY SILKSCREEN

CY4532 EVK Power Board Schematics



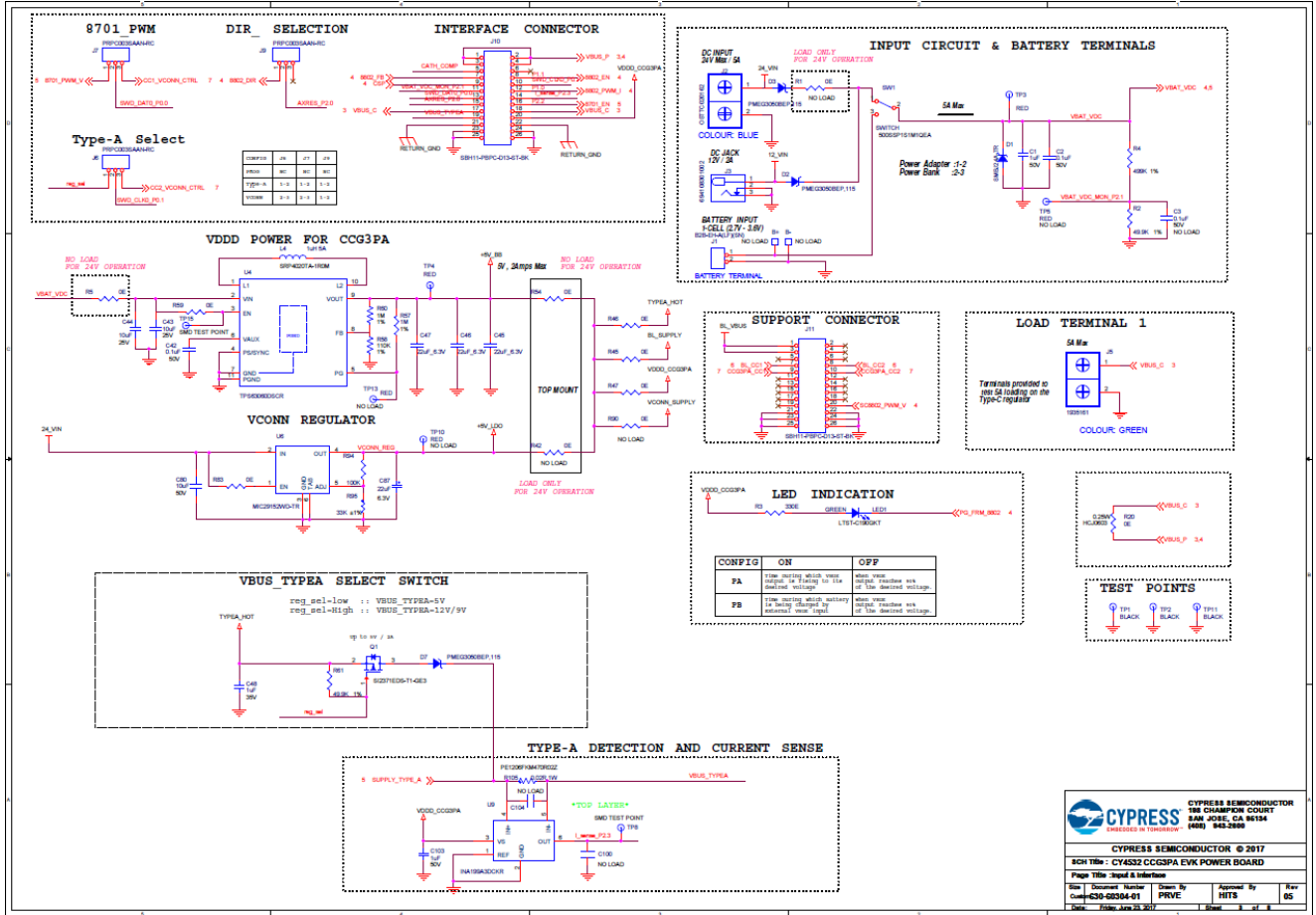
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8701 PWM
 DIR SELECTION

INTERFACE CONNECTOR

INPUT CIRCUIT & BATTERY TERMINALS

VDD POWER FOR CCG3PA

VCONN REGULATOR

SUPPORT CONNECTOR

LOAD TERMINAL 1

LED INDICATION

VBUS TYPE-A SELECT SWITCH

```

reg_sel=low  :: VBUS_TYPEA=5V
reg_sel=high :: VBUS_TYPEA=12V/9V
    
```

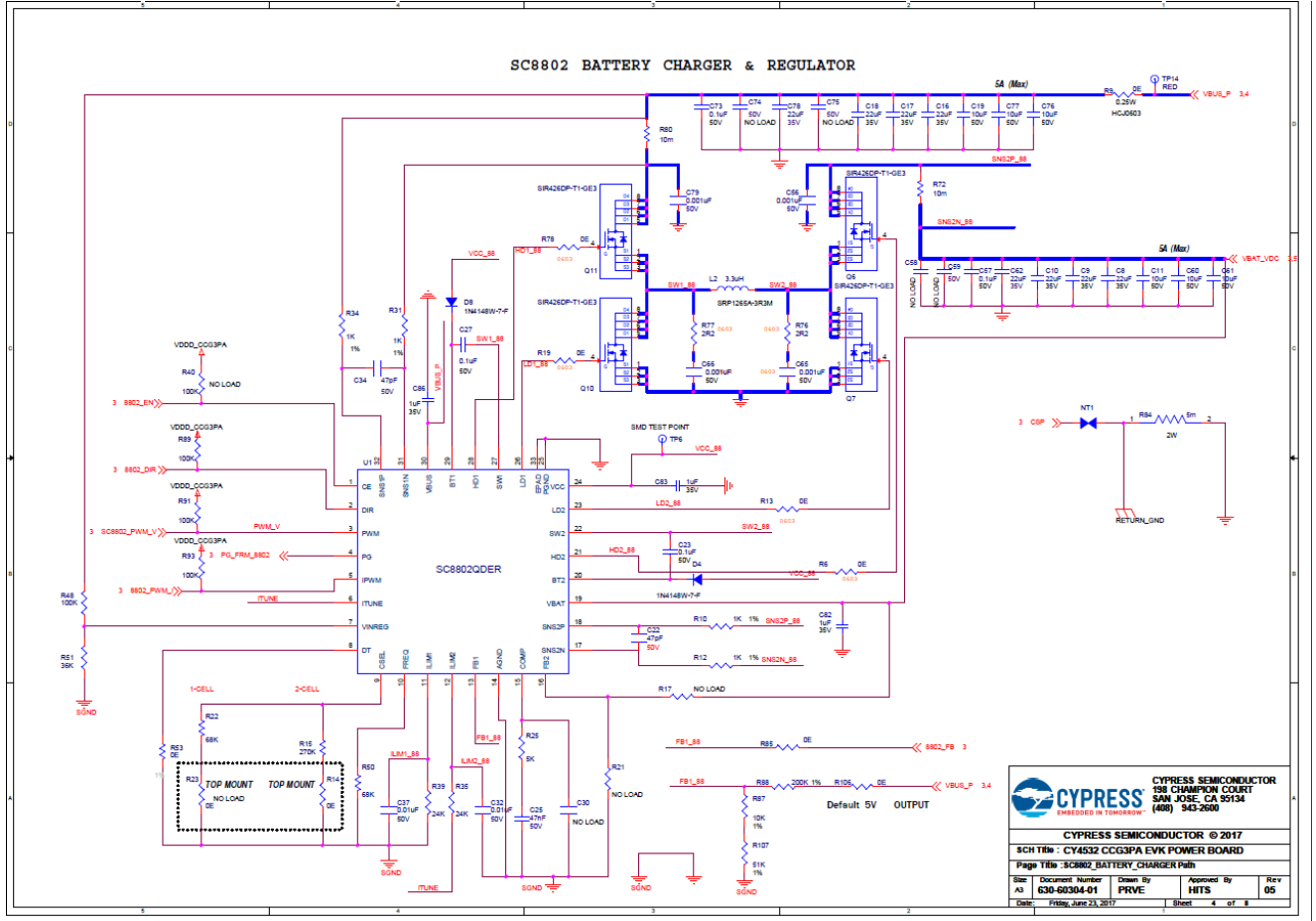
TYPE-A DETECTION AND CURRENT SENSE

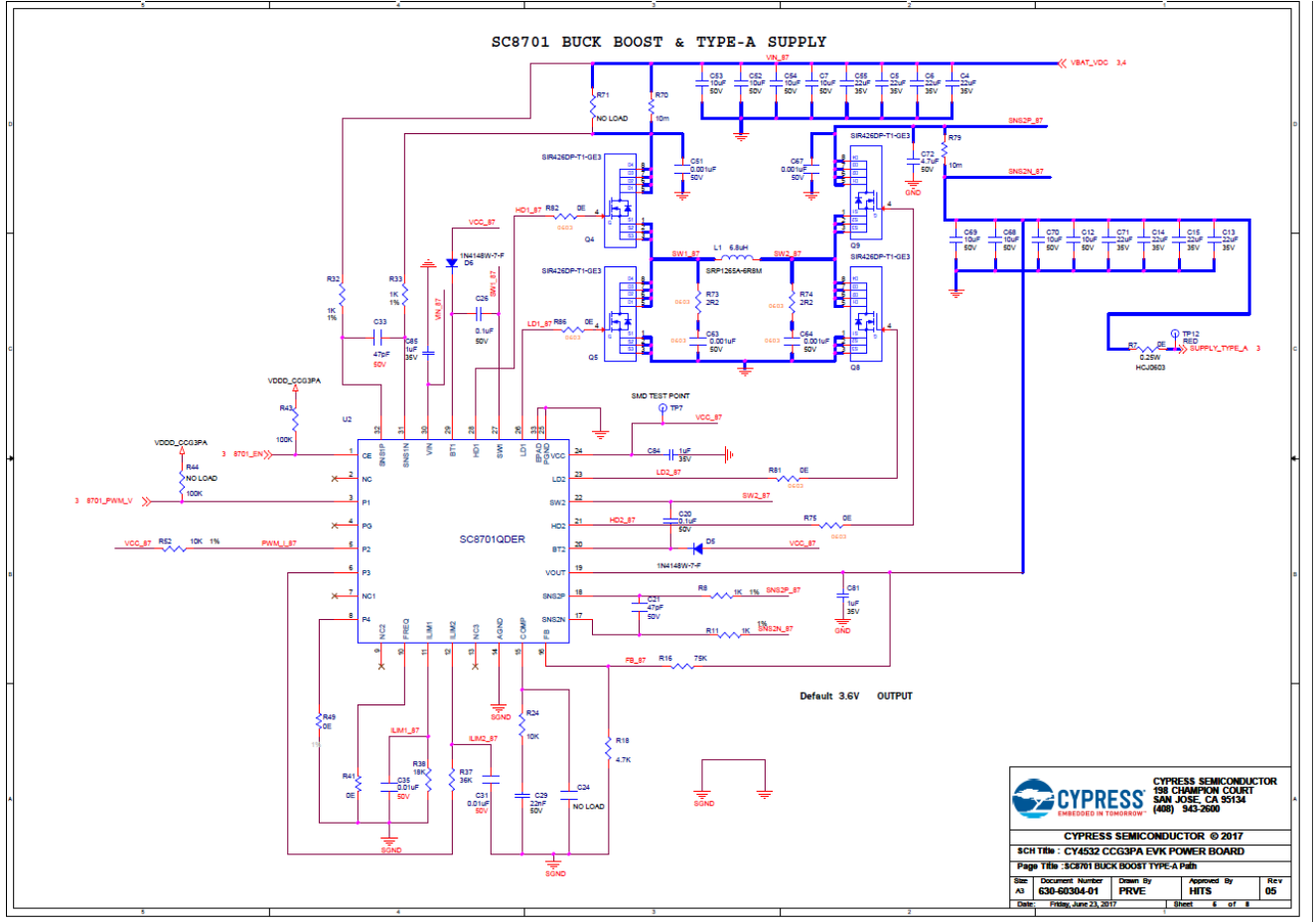
LED INDICATION

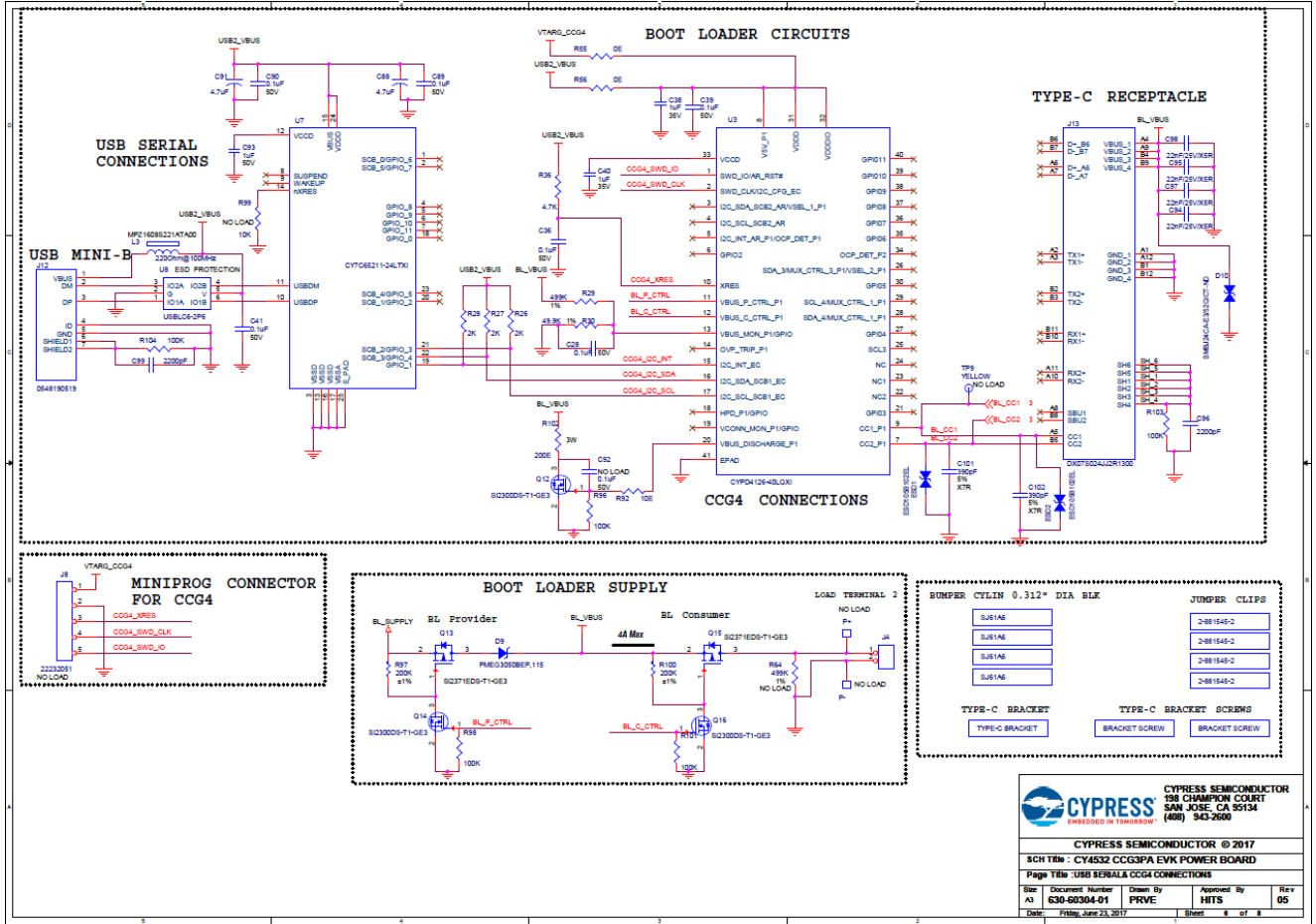
CONFIG	ON	OFF
FA	TYPE-A HOT	TYPE-A HOT
FB	TYPE-A HOT	TYPE-A HOT

TEST POINTS

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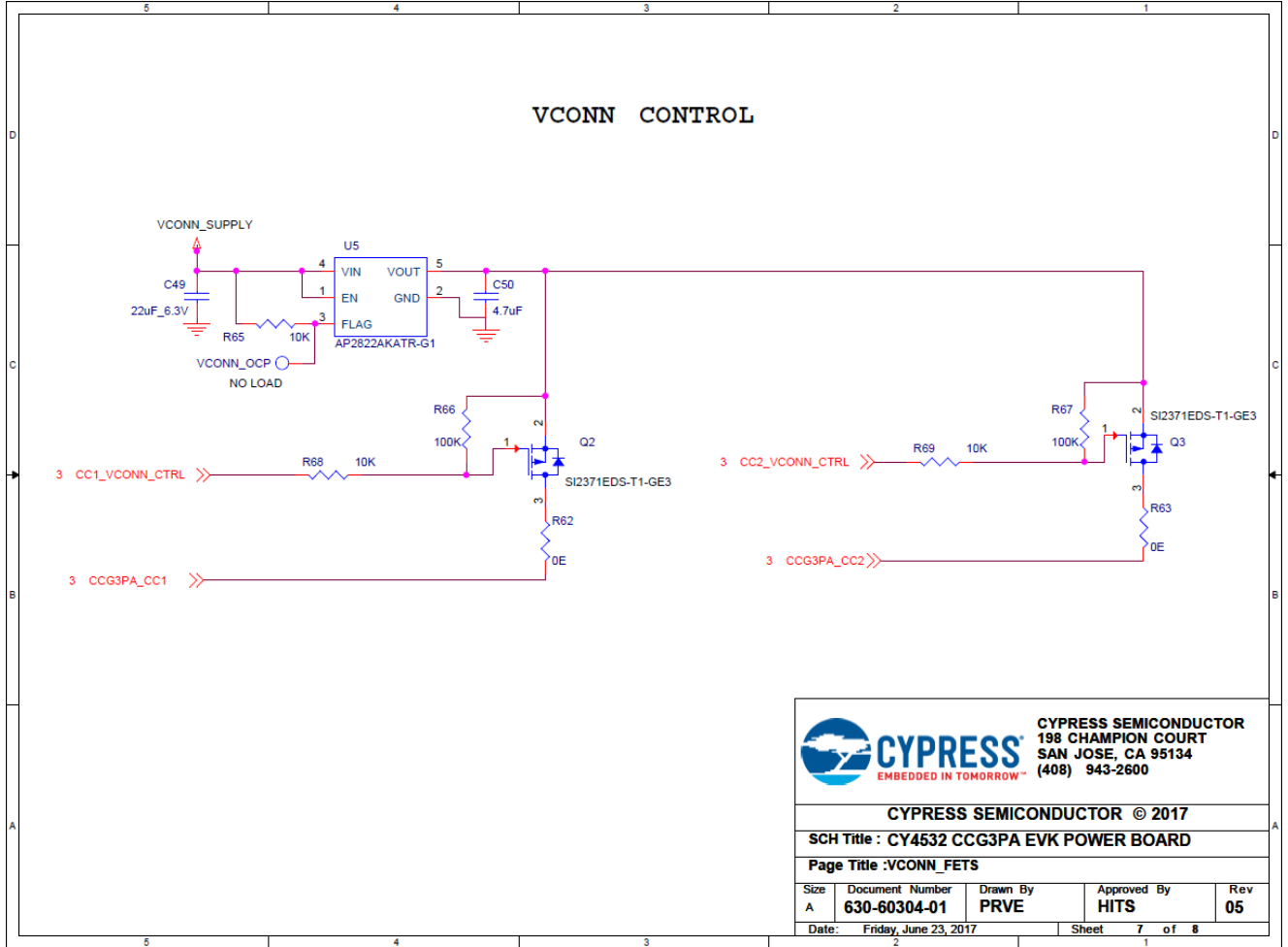
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SCH Title : CY4532 CCG3PA EVK POWER BOARD

Page Title : USB SERIAL & CCG4 CONNECTIONS

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CY4532 EVK Power Board BoM

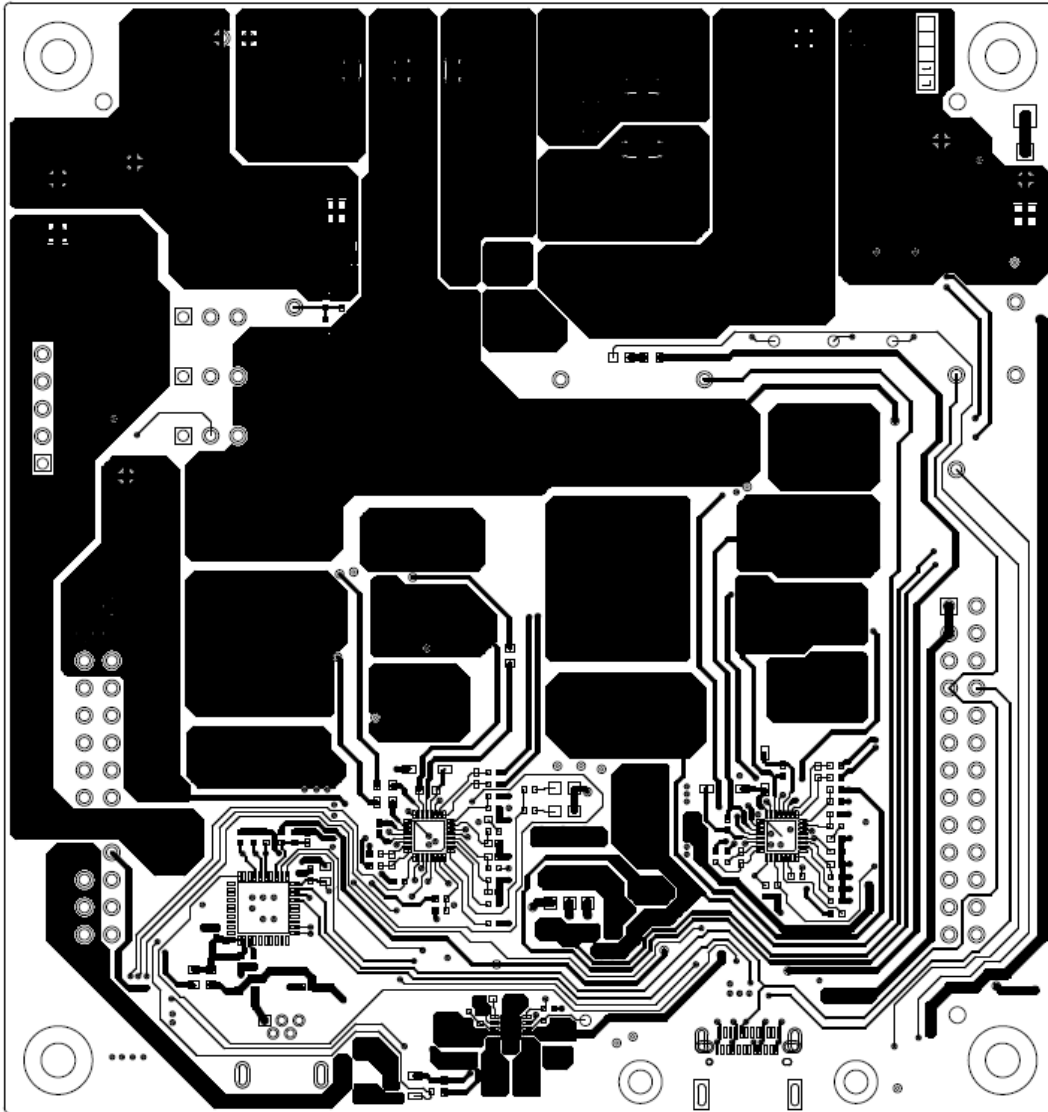
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2	13	C2,C20,C26,C27,C28,C36,C39,C41,C42,C57,C73,C89,C90	0.1uF	CAP CER 0.1UF 50V X7R 0402	TDK Corporation	C1005X7R1H104K050BB
3	16	C4,C5,C6,C8,C9,C10,C13,C14,C15,C16,C17,C18,C55,C62,C71,C78	22uF	CAP CER 22UF 35V JB 1206	TDK Corporation	C3216JB1V226M160AC
4	11	C7,C11,C12,C19,C54,C60,C61,C70,C76,C77,C80	10uF	CAP CER 10UF 50V X7R 1210	KEMET	C1210C106K5RACTU
5	4	C21,C22,C33,C34	47pF	CAP CER 47PF 50V C0G 0402	TDK	C1005C0G1H470G050BA
6	1	C23	0.1uF	CAP CER 0.1UF 50V X7R 0603	KEMET	C0603C104M5RACTU
7	1	C25	47nF	CAP CER 0.047UF 25V X5R 0402	TDK CORPORATION	C1005X5R1E473K050BA
8	1	C29	22nF	CAP CER 0.022uF 50V X5R 0402	TDK Corporation	C1005X5R1H223M050BB
9	4	C31,C32,C35,C37	0.01uF	CAP CER 10000PF 50V X7R 0402	AVX Corporation	04025C103KAT2A
10	9	C38,C40,C48,C81,C82,C83,C84,C85,C86	1uF	CAP CER 1UF 35V X5R 0402	TDK Corporation	C1005X5R1V105K050BC
11	2	C43,C44	10uF	CAP CER 10UF 25V X5R 0603	Murata Electronics North America	GRM188R61E106MA73D
12	4	C45,C46,C47,C49	22uF_6.3V	CAP CER 22UF 6.3V X5R 0603	Murata Electronics North America	GRM188R60J226MEA0D
13	3	C50,C88,C91	4.7uF	CAP CER 4.7UF 10V 20% X5R 0402	TDK Corporation	C1005X5R1A475M050BC
14	8	C51,C56,C63,C64,C65,C66,C67,C79	0.001uF	CAP CER 1000PF 50V X7R 0603	Murata Electronics North America	GRM188R71H102KA01D
15	4	C52,C53,C68,C69	10uF	CAP CER 10UF 50V X5R 1206	Taiyo Yuden	UMK316BBJ106ML-T
16	1	C72	4.7uF	CAP CER 4.7UF 50V X7R 1206	Taiyo Yuden	UMK316AB7475KL-T
17	1	C87	22uF	CAP CER 22UF 6.3V X5R 0805	Murata Electronics North America	GRM21BR60J226ME39L
18	4	C94,C95,C97,C98	22nF/25V/X5R	CAP CER 0.022UF 25V X5R 0402	TDK CORPORATION	C1005X5R1E223K050BA
19	2	C96,C99	2200pF	CAP CER 2200PF 2KV 10% X7R 1808	JOHANSON	202R29W222KV4E
20	2	C101,C102	390pF	CAP CER 390PF 50V 5% X7R 0603	Kemet	C0603C391J5RACTU
21	1	D1	SMBJ24A-TR	TVS DIODE 24VWM 50VC DO214AA	STMicroelectronics	SMBJ24A-TR
22	4	D2,D3,D7,D9	PMEG3050BEP,115	DIODE SCHOTTKY 30V 5A SOD128	NXP Semiconductors	PMEG3050BEP,115
23	4	D4,D5,D6,D8	1N4148W-7-F	Diode Standard 100V 300mA (DC) Surface Mount SOD-123	Diodes Incorporated	1N4148W-7-F
24	1	D10	SMBJ24CA-E3/52GICT	TVS DIODE 24VWM 38.9VC SMB	Vishay Semiconductor Diodes Division	SMBJ24CA-E3/52

			-ND			
25	2	ESD1,ESD2	ESD105B102EL	TVS DIODE 5.5VWM 14VC TSLP2-2	Infineon Technologies	ESD105B102ELE6327XTM A1
26	1	J1	B2B-EH-A(LF)(SN)	CONN HEADER EH TOP 2POS 2.5MM	JST Sales America Inc.	B2B-EH-A(LF)(SN)
27	1	J2	OSTTC020162	TERMINAL BLOCK 5MM VERT 2POS PCB	On Shore Technology Inc.	OSTTC020162
28	1	J3	6.94108E+11	CONN PWR JACK 2.5X5.5MM SOLDER	Würth electronics	6.94108E+11
29	1	J4	961102-6404-AR	CONN HEADER VERT SGL 2POS GOLD	3M	961102-6404-AR
30	1	J5	1935161	TERM BLOCK PCB 2POS 5.0MM GREEN	Phoenix Contact	1935161
31	3	J6,J7,J9	PRPC003S AAN-RC	CONN HEADER .100" SNGL STR 3POS	Sullins Connector Solutions	PRPC003SAAN-RC
32	2	J10,J11	SBH11-PBPC-D13-ST-BK	CONN HEADER 2.54MM 26POS GOLD	Sullins Connector Solutions	SBH11-PBPC-D13-ST-BK
33	1	J12	548190519	CONN USB RECEPTACLE 5POS RT ANG	Molex, LLC	548190519
34	1	J13	DX07S024 JJ2R1300	USB TYP C TP MNT DL RW SMT RECEPT	JAE Electronics	DX07S024JJ2R1300
35	1	LED1	GREEN	LED GREEN CLEAR 0603 SMD	Lite-On Inc.	LTST-C190GKT
36	1	L1	6.8uH	FIXED IND 6.8UH 11.5A 11.5 MOHM	Bourns Inc.	SRP1265A-6R8M
37	1	L2	3.3uH	FIXED IND 3.3UH 18A 6.8 MOHM SMD	Bourns Inc.	SRP1265A-3R3M
38	1	L3	220Ohm @100MHz	FERRITE BEAD 220 OHM 0603 1LN	TDK Corporation	MPZ1608S221ATA00
39	1	L4	1uH 5A	1µH Shielded Wirewound Inductor 5A 27 mOhm Max 2-SMD	Bourns Inc.	SRP4020TA-1R0M
40	5	Q1,Q2,Q3,Q13,Q15	SI2371ED S-T1-GE3	MOSFET P-CH 30V 4.8A SOT-23	Vishay Siliconix	SI2371EDS-T1-GE3
41	8	Q4,Q5,Q6,Q7,Q8,Q9,Q10,Q11	SIR426DP-T1-GE3	MOSFET N-CH 40V 30A PPAK SO-8	Vishay Siliconix	SIR426DP-T1-GE3
42	3	Q12,Q14,Q16	SI2300DS-T1-GE3	MOSFET N-CH 30V 3.6A SOT-23	Vishay Siliconix	SI2300DS-T1-GE3
43	3	R2,R30,R61	49.9K	RES SMD 49.9K OHM 1% 1/16W 0402	Yageo	RC0402FR-0749K9L
44	1	R3	330E	RES SMD 330 OHM 5% 1/10W 0603	Yageo	RC0603JR-07330RL
45	2	R4,R29	499K	RES SMD 499K OHM 1% 1/16W 0402	Yageo	RC0402FR-07499KL
46	20	R5,R6,R7,R9,R13,R19,R20,R23,R45,R46,R47,R54,R55,R56,R75,R78,R81,R82,R86,R90	0E	RES SMD 0.0 OHM 1/4W JUMPER 0603	StackPole Electronics	H CJ0603ZTOR00
47	8	R8,R10,R11,R12,R31,R32,R33,R34	1K	RES SMD 1K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF1001X
48	1	R15	270K	RES SMD 270K OHM 1% 1/16W 0402	Yageo	RC0402FR-07270KL

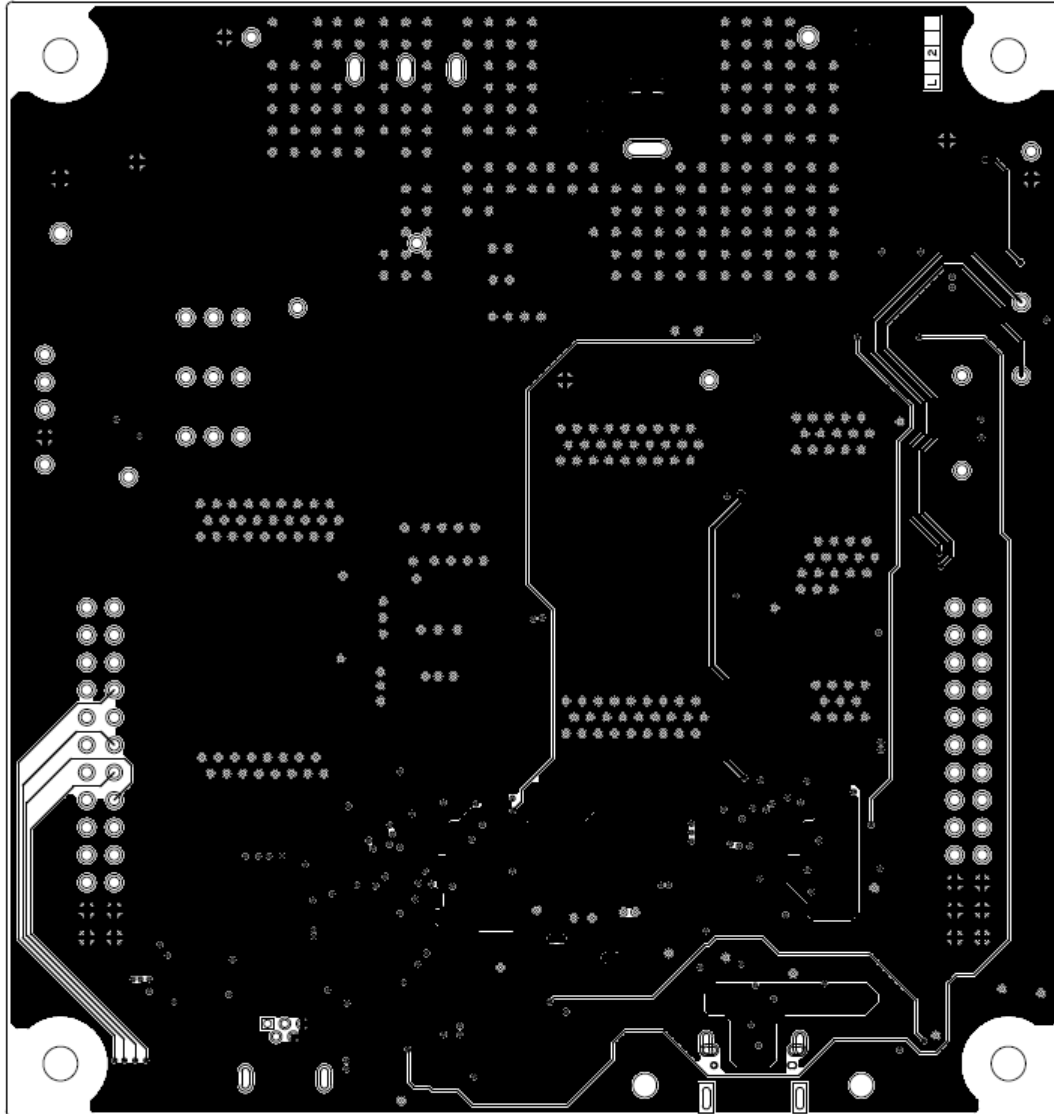
49	1	R16	75K	RES SMD 75K OHM 1% 1/16W 0402	Samsung Electro-Mechanics America, Inc.	RC1005F753CS
50	1	R18	4.7K	RES SMD 4.7K OHM 5% 1/16W 0402	Yageo	RC0402JR-074K7L
51	2	R22,R50	68K	RES SMD 68K OHM 5% 1/16W 0402	Yageo	RC0402JR-0768KL
52	6	R24,R52,R65,R68,R69,R87	10K	RES SMD 10K OHM 1% 1/16W 0402	Samsung Electro Mehcanics	RC1005F103CS
53	1	R25	5K	RES SMD 5K OHM 0.1% 1/20W 0402	Vishay Dale	PNM0402E5001BST1
54	3	R26,R27,R28	2K	RES SMD 2K OHM 5% 1/16W 0402	Yageo	RC0402JR-072KL
55	2	R35,R39	24K	RES SMD 24K OHM 1% 1/16W 0402	Samsung Electro-Mechanics America, Inc.	RC1005F243CS
56	1	R36	4.7K	RES SMD 4.7K OHM 1% 1/10W 0603	Yageo	RC0603FR-074K7L
57	2	R37,R51	36K	RES SMD 36K OHM 1% 1/16W 0402	Samsung Electro Mehcanics	RC1005F363CS
58	1	R38	18K	RES SMD 18K OHM 1% 1/16W 0402	Samsung Electro Mehcanics	RC1005F183CS
59	9	R41,R49,R53,R59,R62,R63,R83,R85,R106	0E	RES SMD 0.0OHM JUMPER 1/10W 0402	Vishay Beyschlag	MCS04020Z0000ZE000
60	13	R43,R48,R66,R67,R89,R91,R93,R94,R96,R98,R101,R103,R104	100K	RES SMD 100K OHM 1% 1/16W 0402	Yageo	RC0402FR-07100KL
61	2	R57,R60	1M	RES SMD 1M OHM 1% 1/16W 0402	Yageo	RC0402FR-071ML
62	1	R58	110K	RES SMD 110K OHM 5% 1/16W 0402	Yageo	RC0402JR-07110KL
63	4	R70,R72,R79,R80	10m	RES SMD 0.01 OHM 1% 1W 1206	Panasonic Electronic Components	ERJ8BWF010V
64	4	R73,R74,R76,R77	2R2	RES SMD 2.2 OHM 5% 1/10W 0603	Panasonic Electronic Components	ERJ-3GEYJ2R2V
65	1	R84	5m	RES SMD 0.005 OHM 1% 2W 2512	Stackpole Electronics Inc.	CSNL2512FT5L00
66	1	R88	200K	RES SMD 200K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF2003X
67	1	R92	10E	RES SMD 10 OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF10R0X
68	1	R95	33K	RES SMD 33K OHM 1% 1/10W 0603	Yageo	RC0603FR-0733KL
69	2	R97,R100	200K	RES SMD 200K OHM 5% 1/10W 0603	PANASONIC ELECTRONIC COMPONENTS	ERJ-3GEYJ204V
70	1	R102	200E	RES SMD 200 OHM 5% 1W 2512	Rohm Semiconductor	MCR100JZHJ201
71	1	R105	0.02R,1W	RES SMD 0.02 OHM 1% 1W 1206	Yageo	PE1206FKM470R02Z
72	1	R107	51K	RES SMD 51K OHM 1%	Yageo	RC0402FR-0751KL

				1/16W 0402		
73	1	SW1	SWITCH	Slide Switch SPDT Through Hole	E-SWITCH	500SSP1S1M1QE A
74	3	TP1,TP2,TP11	BLACK	TEST POINT PC MINI .040"D BLACK	Keystone Electronics	5001
75	4	TP3,TP4,TP12,TP14	RED	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000
76	1	U1	SC8802Q DER	Battery Charger	SouthChip	SC8802QDER
77	1	U2	SC8701Q DER	Buck Boost	SouthChip	SC8701QDER
78	1	U3	CYPD4126-40LQXI	CCG4 SINGLE PORT PD CONTROLLER	Cypress Semiconductor	CYPD4126-40LQXI
79	1	U4	TPS63060 DSCR	IC REG BUCK BOOST ADJ 2A 10WSON	Texas Instruments	TPS63060DSCR
80	1	U5	AP2822AK ATR-G1	IC USB POWER SWITCH SOT25	Diodes Incorporated	AP2822AKATR-G1
81	1	U6	MIC29152 WD-TR	IC REG LDO ADJ 1.5A TO252-5	Microchip Technology	MIC29152WD-TR
82	1	U7	CY7C6521 1-24LTXI	IC USB TO UART BRIDGE DUAL 32QFN	Cypress Semiconductor Corp	CY7C65211-24LTXI
83	1	U8	USBLC6-2P6	TVS DIODE 5.25VWWM 17VC SOT666	STMicroelectronics	USBLC6-2P6
84	1	U9	INA199A3 DCKR	IC OPAMP CURR SENSE 14KHZ SC70-6rrent Sense Amplifier 1 Circuit SC-70-6	Texas Instruments	INA199A3DCKR

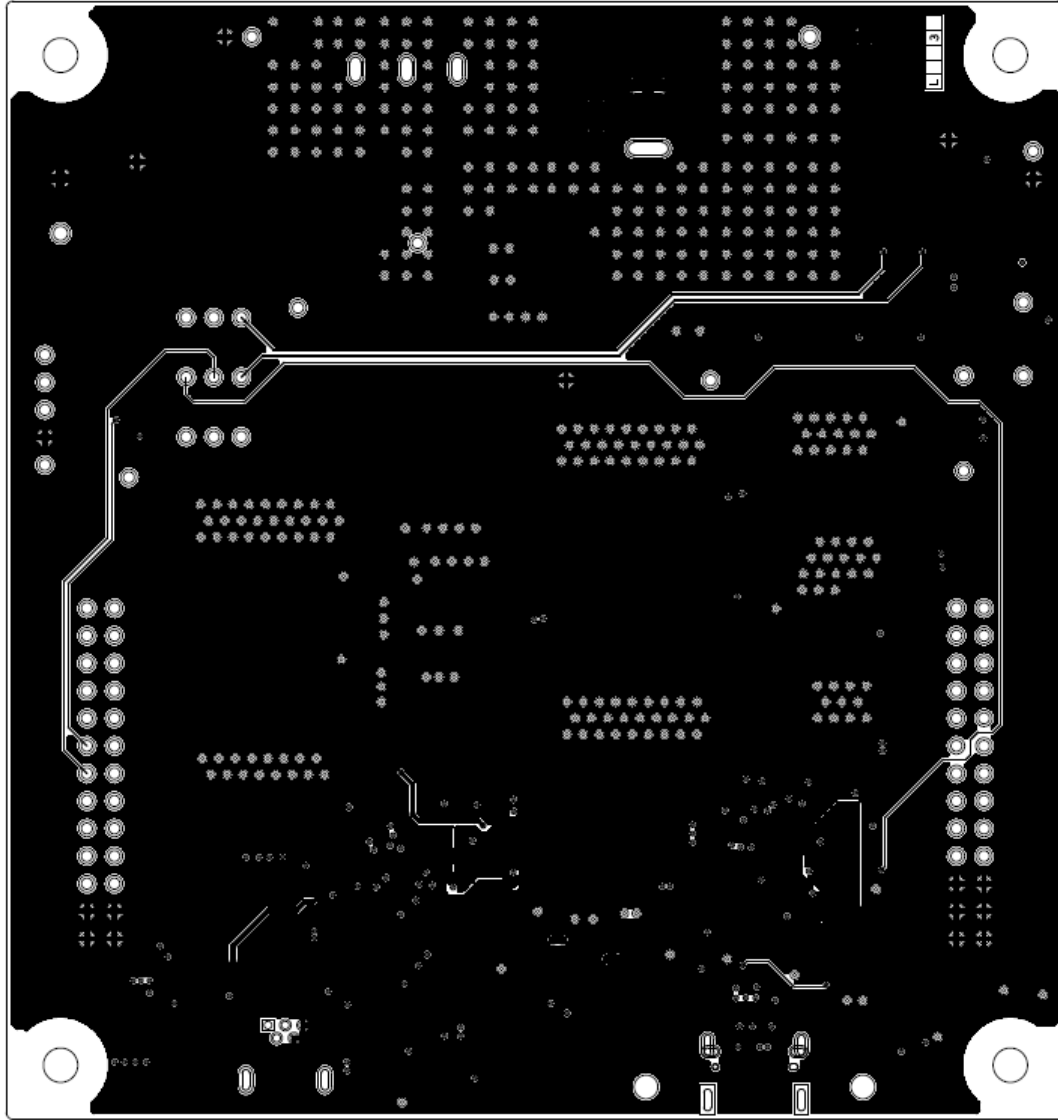
CY4532 EVK Power Board Layout



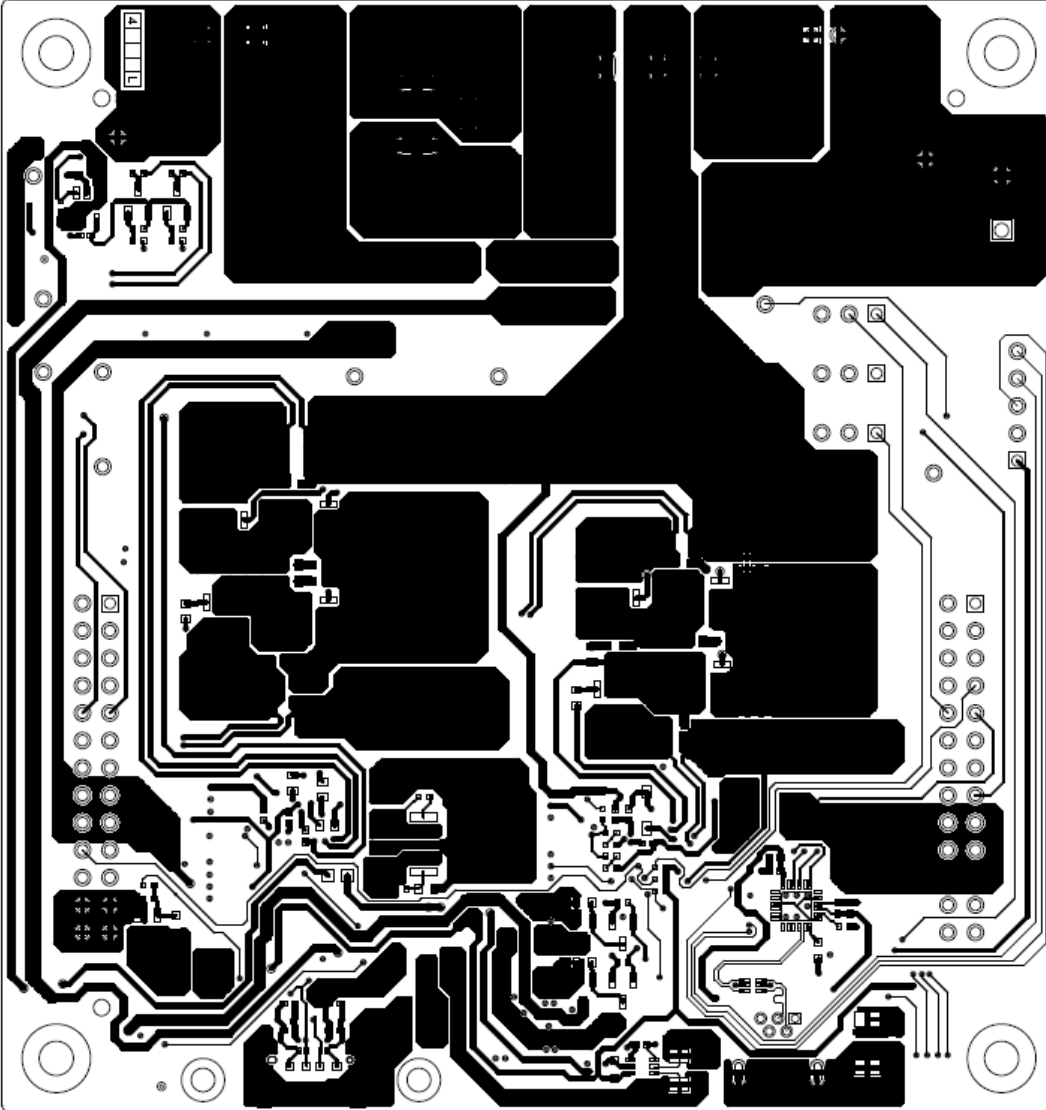
600-60414-01 REV04 PRIMARY SIDE



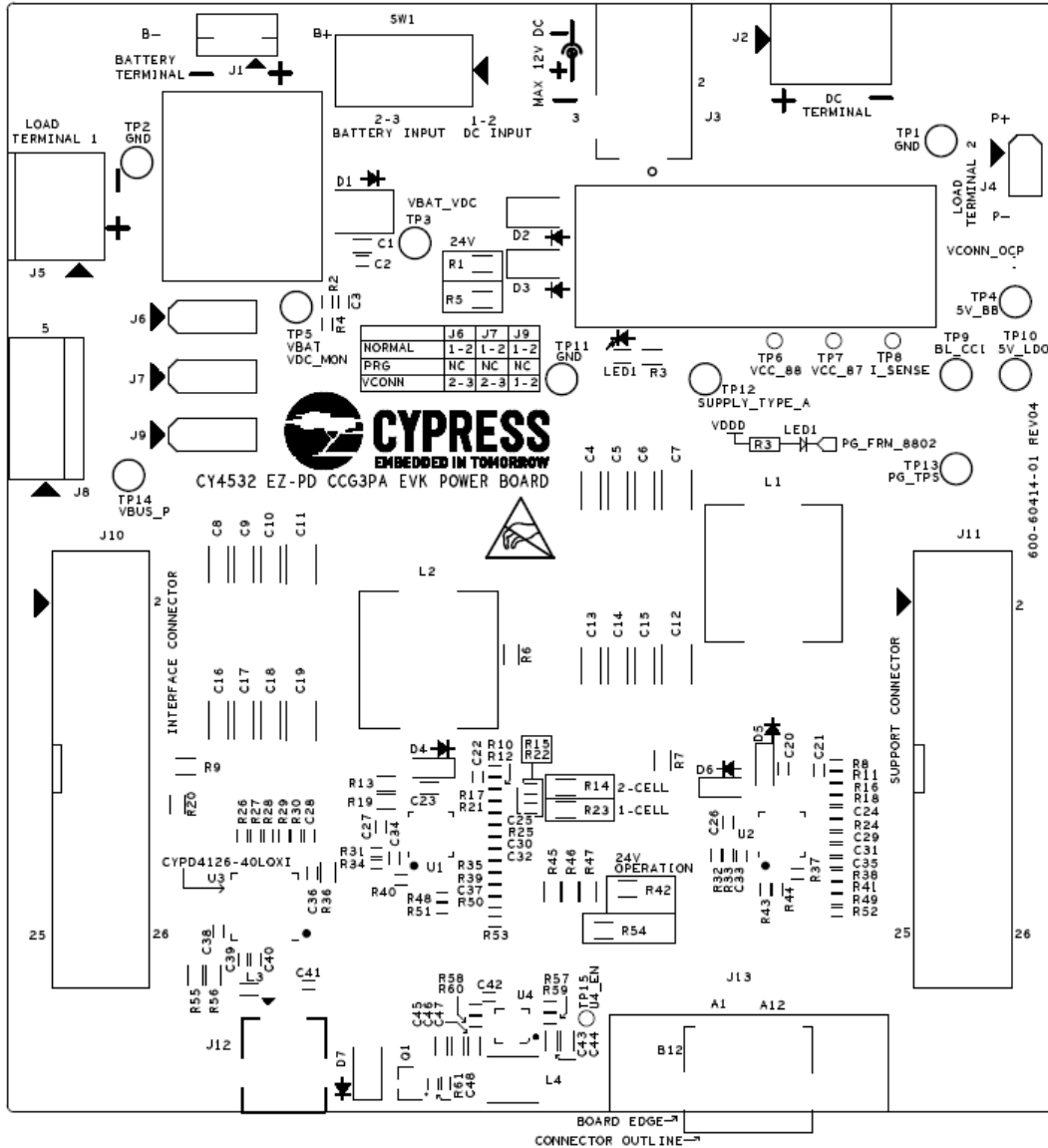
600-60414-01 REV04 GROUND1 LAYER



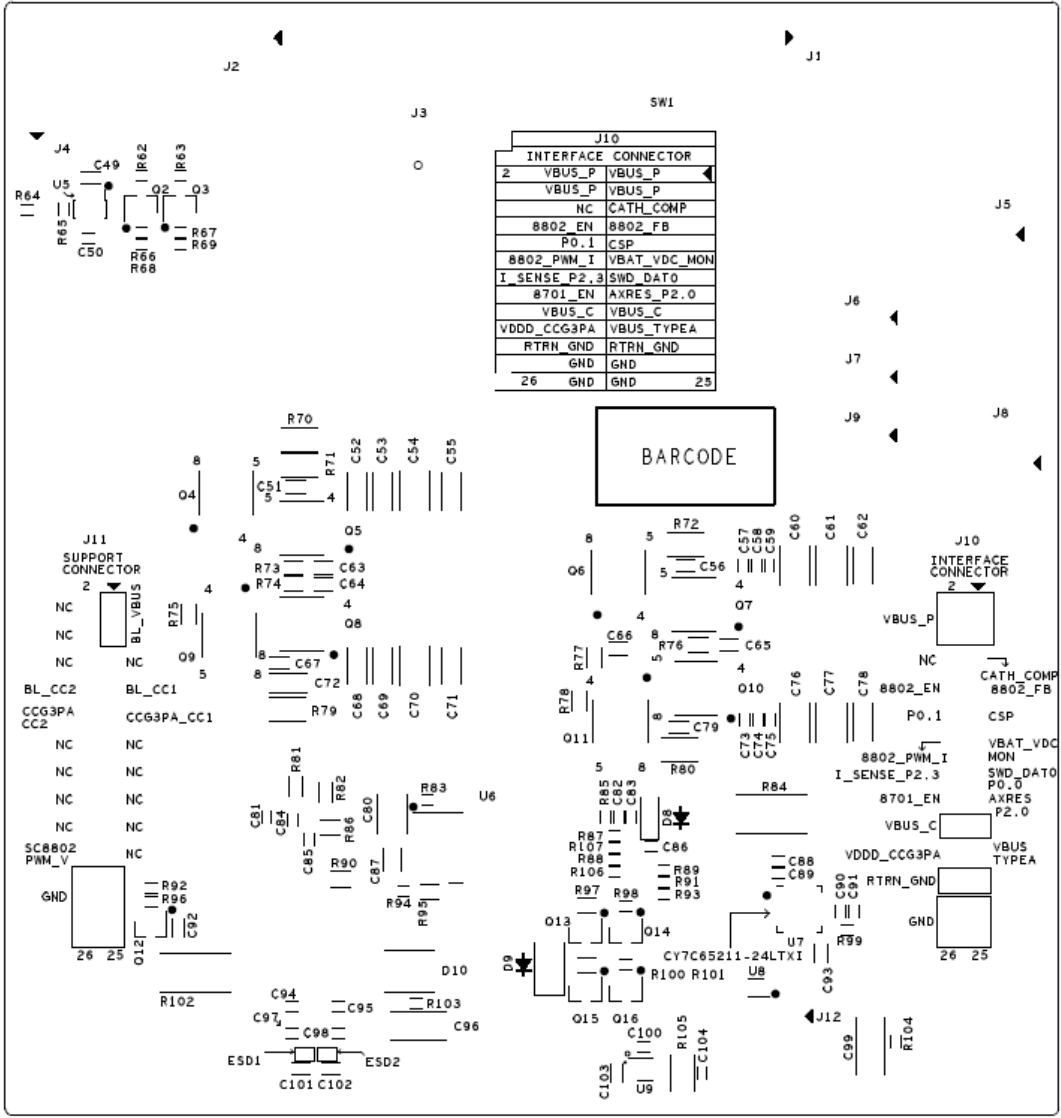
600-60414-01 REV04 GROUND2 LAYER



600-60414-01 REV04 SECONDARY SIDE



600-60414-01 REV04 PRIMARY SILKSCREEN



600-60414-01 REV04 SECONDARY SILKSCREEN

Revision History



Document Revision History

Document Title: CY4532 EZ-PD™ CCG3PA Evaluation Kit Guide			
Document Number: 002-18680			
Revision	Issue Date	Origin of Change	Description of Change
**	07/02/2017	SELV	New EVK kit guide.