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Cypress EZ-PD™ CCGx Power SDK Release Notes

Version 3.5, September 12, 2020

Thank you for your interest in the EZ-PD™ CCGx Power Software Development Kit (SDK). This version of the CCGx Power SDK currently supports the CCG3PA, CCG3PA-NFET and PAG1S family of Type-C controllers and is targeted at the USB-PD port controller applications for power adapters and power banks.

Introduction

The CCGx Power SDK provides a set of firmware resources that allows users to build customized applications using the CCGx family of Type-C port controllers from Cypress.

This is based on a CCGx firmware stack and provides programming hooks and interfaces for customers to implement their own policy and system management schemes.

The key application-level requirements for the firmware stack are as follows:

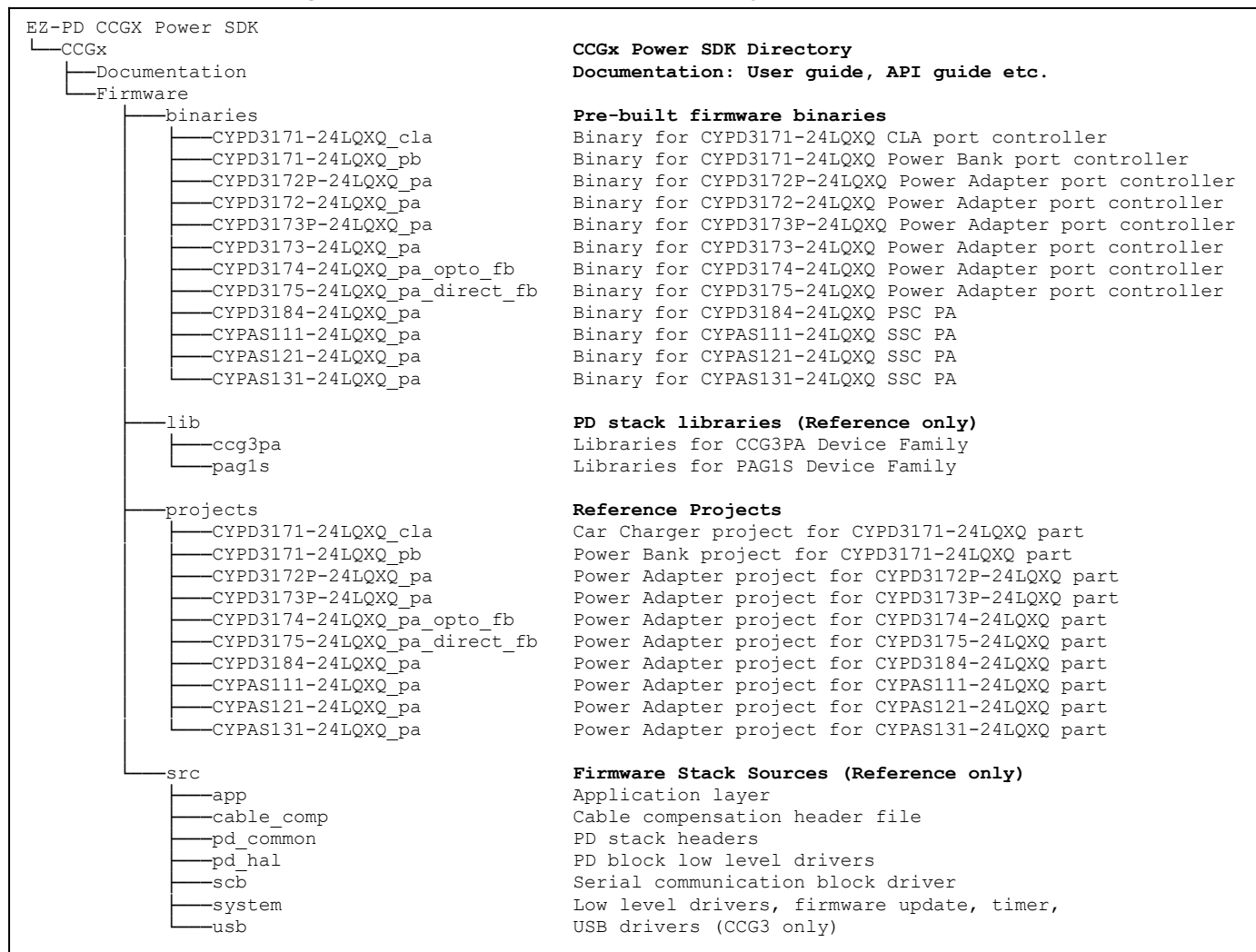
- USB Type-C Revision 2.0 and USB-PD Revision 3.0 v2.0 specification compliant PD stack for CCG3PA Car Charger (CYPD3171-24LQXQ), CCG3PA Power bank (CYPD3171-24LQXQ), CCG3PA power adapter with opto-isolator control (CYPD3174-24LQXQ), CCG3PA power adapter application with direct feedback control (CYPD3175-24LQXQ), CCG3PA-NFET based power adapter with opto-isolator control (CYPD3172P-24LQXQ/ CYPD3172-24LQXQ), CCG3PA-NFET based power adapter with direct feedback control (CYPD3173P-24LQXQ/ CYPD3173-24LQXQ), PAG1S based primary side controlled (PSC) power adapter (CYPD3184-24LQXQ), PAG1S based 20W secondary side controlled (SSC) power adapter (CYPAS111-24LQXQ), PAG1S based 33W secondary side controlled (SSC) power adapter (CYPAS121-24LQXQ), PAG1S based 45W secondary side controlled (SSC) power adapter (CYPAS131-24LQXQ) applications.
- Drivers for the various hardware blocks on the CCGx controllers.
- Allow manufacturing-level customization of device parameters such as power profiles, default port behavior, Over Voltage Protection, and so on, without changing the firmware.
- Map firmware to system hardware design changes without any impact on the core firmware modules.
- Facilitate source-level debugging so that new customers can get familiarized with the stack.

Firmware Organization

The CCGx Firmware Stack is released in the form of an SDK, which contains the firmware stack as well as reference firmware projects that use the stack to implement USB-PD applications.

CCGx devices follow the firmware stack available in the **CCGx** sub-directory and the current stack version is 3.5 Build 2649. All stack documentation for CCGx device family is available under **CCGx > Documentation**.

Figure 1: EZ-PD™ CCGx Power SDK Directory Structure



CCGx contain the following folders:

- **Documentation:** The docs folder contains the EZ-PD™ CCGx Power SDK documentation, which includes release notes, user guide, and API reference guide.
- **Firmware:** The Firmware folder contains the firmware stack sources, reference projects, and pre-built firmware binaries targeted for the Kits and reference designs from Cypress.

- **binaries:** The binaries folder contains the pre-built firmware binaries
- **lib:** The lib folder contains the USB-PD stack and HPI module in pre-compiled library format.
- **projects:** The projects folder contains the sources and PSoC Creator workspaces for the port controller designs.
- **src:** The src folder contains the sources for the CCGx firmware stack organized by firmware module.

NOTE: This directory is made available for reference. Each reference project has a copy of the src directory added to it locally.

The src folder has the following sub-folders:

- **app:** The app folder contains the top-level application layer functionality that implements the required USB-PD controller functions. This includes functionality such as PDO evaluation and contract negotiation, VDM handling for both DFP and UFP roles, handling of control messages such as role swap; and alternate mode discovery and negotiation. The alternate mode specific implementation can be found in the app/alt_mode directory. The app folder also includes handlers for legacy charger detection and Type-A port controller detection.
- **cable_comp:** The cable_comp folder contains the API interface definition for facilitating voltage compensation for cable resistance (configurable via the Configuration Utility) induced voltage drop.
- **pd_common:** The pd_common folder contains the headers for the core Type-C and USB-PD stack for the CCGx device. This includes the HAL, the Type-C port manager, the USB-PD protocol layer, the USB-PD policy engine, and the Device Policy Manager.
- **pd_hal:** The pd_hal folder contains the low-level driver header and source files for USB-PD hardware block.
- **scb:** The scb folder contains the API interface definition for the dedicated I2C slave driver using the Serial Controller Blocks (SCB) on the CCGx device. Since I2C slave mode is the most commonly-used interface for CCGx, a specially optimized driver is provided for the same.
- **system:** The system folder contains header and source files relating to the CCGx device hardware and registers, bootloader and flash access functions, low-level drivers for the GPIO blocks on the CCGx device, a soft timer implementation that is used by the firmware stack.
- **usb:** The usb folder contains driver header and source files for the USB block on the CCG3 device.

CCGx Reference Application Projects Limitations and Workarounds

1. The CYPD3171-24LQXQ_cla project is intended to work on the CY4532 CCG3PA EVK and is targeted for CYPD3171-24LQXQ silicon part. This part has a dead battery Rd which should not be there for a power adapter application. The production CLA application is expected to use CYPD3175-24LQXQ. The project can be easily modified to run on CYPD3175-24LQXQ silicon part. Refer to the CCGx Power SDK User Guide for more details.
2. CY4532 Kit does not have accurate Type-C Rsense resistor. Programmable Power Supply (PPS) support requires very accurate current sensing. Rsense needs to be accurate for this to work. Replace the resistance if its value 5mOhm is not within the 1% of 5mOhm. This also affects the OCP behavior.
3. Type-C VBUS Short Circuit protection (SCP) is left disabled by default. This is to avoid spurious SCP detection on late attach of cable via a Type-A to Type-C adapter. If the adapter is first plugged in and then the Type-A plug is attached to the adapter, this may result in ground bounce due to the attach and trigger false SCP.
4. The USB-PD stack has been updated in SDK to comply with USB PD Rev3.0 Version 2.0. Since the USB-PD compliance test tools have not been updated to this revision, some of the USB-PD tests (DFP VDO count related) are likely to fail. These failures can be waived until the test tools are updated to the latest USB PD revision.

CCGx Power SDK Version 3.5 Changes

1. EZ-PD™ CCGx Power SDK has been updated to be compliant to USB Type-C Cable and Connector Specification Release 2.0 and Power Delivery Specification Revision 3.0 Version 2.0.
2. CYPD3174-24LQXQ_pa_opto_fb has been updated to work with NXP (erstwhile Diodes) based power plant and source VCONN for EMCA cables communication.
3. CYPD3175-24LQXQ_pa_direct_fb has been updated to work with MPS (erstwhile PI) based power plant and source VCONN for EMCA cables communication.
4. CYPD3174-24LQXQ_pa_opto_fb and CYPD3175-24LQXQ_pa_direct_fb has been updated to support total port power of 65 watts.
5. Added reference solutions in SDK for CCG3PA-NFET family of devices.
6. Added support for next generation of 20 Watts and 45 Watts Power Adapter solutions based on PAG1S device family from Cypress. 18 Watts PAG1S + P solution support in SDK has been deprecated now.
7. Incorporated support to enable tuning of voltage transition speed (multi-slope) for both upward and downward change direction.



8. Improved interoperability support across various non-compliant devices.
9. Over Temperature Protection (OTP) feature support in CYPD3175-24LQXQ_pa_direct_fb solution has been deprecated as no onboard thermistor is present now with MPS based power plant
10. SDK solutions facilitate compile-time selection of less than 5 volts VBUS_IN discharging feature.
11. QC and AFC charging feature is also compile-time selectable now.

Tool Requirements

1. This version of SDK requires PSoC Creator 4.4 build 47 or higher for compilation. PSoC Creator will be installed along with the SDK.
2. This version of SDK requires EZ-PD™ Configuration Utility version 1.3.2 build 350 or higher. Download the latest version of the EZ-PD™ Configuration Utility installer from:
<http://www.cypress.com/ezpdutility>

Technical Support

For further assistance, go to <http://www.cypress.com/go/support>



Additional Information

For more information about the EZ-PD Configuration Utility, visit the web page:

<http://www.cypress.com/documentation/software-and-drivers/ez-pd-configuration-utility>

For more information about the Cypress Type-C controller family, visit the web page:

<http://www.cypress.com/products/usb-type-c-and-power-delivery>



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