



Release Notes

CCGx Software Development Kit

Version 3.0.1, November 9, 2016

Thank you for your interest in the CCGx Software Development Kit (SDK). This version of the CCGx SDK supports the CCG2, CCG3, CCG4 and CCG4PD3 families of Type-C controllers and is targeted at the USB-PD port controller applications for desktop, notebook computers, power adapters and dongles.

Introduction

The CCGx 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, which is tested and proven to be fully compliant with the USB Type-C and USB-PD specifications, and provides programming hooks and interfaces for customers to implement their own policy and system management schemes.

The firmware stack provided by this version of the SDK supports the CCG2, CCG3, and CCG4 product families and is targeted at implementing USB-PD port controllers for desktop, notebook computers, power adapters and dongles.

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

- Type-C Revision 1.2 and USB-PD Revision 2.0 specification compliant PD stack for CCG2.
- USB Type-C Revision 1.2 and USB-PD Revision 2.0 specification compliant PD stack for CCG4 PD2 parts (CYPD4125-40LQXI and CYPD4225-40LQXI)
- USB Type-C Revision 1.2 and USB-PD Revision 3.0 specification compliant PD stack for CCG3 Charge-Through Dongle (CYPD3123-40LQXI), CCG3 notebook (CYPD3125-40LQXI), CCG3 dongle (CYPD3120-40LQXI) and power adapter (CYPD3135-40LQXI) applications and CCG4 PD3 parts (CYPD4126-40LQXI and CYPD4226-40LQXI).
- Drivers for the various hardware blocks on the CCGx controllers.
- Implementation of a Host Processor Interface (HPI) that allows an external embedded controller to monitor and control the CCGx device operation.
- Implementation of the DisplayPort Alternate Mode that allows transfer of video signals over the Type-C data lanes.
- 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.

CCG2 Reference Application Projects Limitations and Workarounds

1. The reference application projects provided for CCG2 are firmware-only projects. The pin assignments used in the CCG2 devices for these example projects closely match the reference application diagrams in the [CCG2 datasheet](#).
2. For Notebook applications that utilize CCG2 devices, due to the limited flash size of 32 KB, there is almost no flash space left for the user to add their own custom firmware, without removing some sections of the code. Customers can use the mobile phone example as a starting point since it provides some free flash space compared to the Notebook project since DisplayPort alternate mode support is not present. For full-featured Notebook applications, customers are encouraged to use CCG3 or CCG4 based Notebook application projects as a starting point.
3. The reference applications require ARM MDK toolchain for compilation. This is done so that the code can be optimized better and the projects can build successfully. Please note that Code Example project created based on the reference applications require the toolchain to be updated explicitly. Refer to the Reference Application Guides in the Documentation directory for more information.

CCG3 and CCG4 Reference Application Projects Limitations and Workarounds

1. The CYPD3123-40LQXI_ctd_us project (Charge Through Dongle / Multiport Adapter project) provided for CCG3 is tested on the reference design that can be found in the following link:
<http://www.cypress.com/documentation/reference-designs/ez-pd-ccg3-usb-type-c-charge-through-dongle>
2. The CYPD3120-40LQXI_dp_dongle, CYPD3135-40LQXI_power_adapter projects provided for CCG3 utilize the reference schematics available in the following KB articles:
<http://www.cypress.com/knowledge-base-article/ccg3-based-c-dp-dongle-solution-demo-kba215672>
<http://www.cypress.com/knowledge-base-article/ccg3-based-power-adapter-solution-demo-kba215673>
3. The compliance tools have not been updated for PD 3.0 compliance and may have failures with the PD 3.0 stack. These failures have been attributed to tester errors. Refer to the CCGx Firmware User Guide for downgrading the firmware to PD 2.0 specification.

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.

The CCG2 devices follow the firmware stack available in the **CCG2** sub-directory and the stack version for CCG2 is 2.3.1 Build 306. All stack documentation for CCG2 is available under **CCG2 > Documentation**.

CCG3 and CCG4 devices follow the firmware stack available in the **CCG3_CCG4** sub-directory and the stack version for CCG3 and CCG4 devices is 3.0.0 Build 763. All stack documentation for CCG3 and CCG4 is available under **CCG3_CCG4 > Documentation**.

NOTE: *The Host Processor Interface register information for Notebook projects is available upon request under a Non-disclosure agreement. Contact your local Cypress FAE or Cypress Technical Support to get this document.*

Figure 1: CCGx SDK Directory Structure



CCG2 directory contains the SDK for CCG2 product family and it has the following sub-folders:

- **Documentation:** The docs folder contains the CCG2 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 binary.
 - **binaries:** The binaries folder contains the pre-built firmware binary for reference design.
 - **projects:** The projects folder contains the sources and PSoC Creator workspace for the notebook port controller design based on CYPD2122-24LQXI and power adapter port controller design based on CYPD2134-24LQXI.
 - **src:** The src folder contains the sources for the CCG2 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.
- **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 GPIO and USB-PD blocks on the CCGx device, and a soft timer implementation that is used by the firmware stack.
- **hpiiss:** The hpiiss folder contains the header file for the HPI, which is an I²C-based software protocol that allows an external Embedded Controller (EC) to monitor and control the CCGx device operation. HPI provides a register-based interface through which the EC can manage the power contracts, send and receive VDMs, and perform flash read/write operations. Contact Cypress for more details about the HPI interface and its capabilities.
- **flashss:** The flashss folder contains the header and source files related to Flash read / write.
- **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 Hardware Adaptation Layer (HAL), the Type-C port manager, the USB-PD protocol layer, the USB-PD policy engine, and the Device Policy Manager.
- **dp_source:** The dp_source directory contains the Display Port alternate mode implementation as a Display Port source.

CCG3_CCG4 contain the following folders:

- **Documentation:** The docs folder contains the CCG3 / CCG4 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 CY4541 and CY4531 Evaluation Kits 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.

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

- **projects:** The projects folder contains the sources and PSoC Creator workspaces for the port controller designs based on CYPD3125-40LQXI, CYPD4125-40LQXI, CYPD4225-40LQXI, CYPD4126-40LQXI, CYPD4226-40LQXI and CYPD3123-40LQXI.
- **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.
- **ar_slave:** The ar_slave folder contains the I2C slave-based implementation of the PD controller interface module to an Intel Alpine Ridge controller.
- **hpiss:** The hpiss folder contains the header file for the HPI, which is an I2C-based software protocol that allows an external Embedded Controller (EC) to monitor and control the CCGx device operation. HPI provides a register-based interface through which the EC can manage the power contracts, send and receive VDMs, and perform flash read/write operations. Contact Cypress for more details about the HPI interface and its capabilities.
- **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 driver code for I2C slave mode operation 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, and 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 CCGx device.

Tool Requirements

1. This version of SDK requires PSoC Creator 3.3 DP1 build 9674 or higher for compilation. Download the latest PSoC Creator version from:
<http://www.cypress.com/products/psoc-creator-integrated-design-environment-ide>
You can download older versions of PSoC Creator from:
<http://www.cypress.com/documentation/software-and-drivers/psoc-creator-software-archive>
2. CCG2 reference applications also require ARM MDK Version 5.16a or higher. The ARM MDK can be downloaded from:
<http://www2.keil.com/mdk5>
3. This version of SDK requires EZ-PD Configuration Utility version 1.0 build 100. Download the latest version of the EZ-PD™ Configuration Utility installer from:
<http://www.cypress.com/ezpdutility>

CCGx SDK Version 3.0.1 Changes

1. CCG2 Firmware Stack updated to version 2.3.1. The following are the changes in the CCG2 Firmware stack:
 - a. Firmware stack updated to improve PD PHY performance for $V_{dd} = 2.7\text{-to-}5.5\text{V}$ for Sink and $3.0\text{-to-}5.5\text{V}$ for Source.
 - b. Fixed firmware version location in HPI array.
 - c. Updated default sink PDOs for Notebook and Mobile applications (5,9,14.8,15,20V @ 900mA)
 - d. Fixed rare race conditions between WDT and heartbeat timer.
2. CCG3 changes
 - a. [Changed the CYPD3120-40LQXI_dp_dongle project settings to support PD 3.0.](#)
 - b. [Changed the CYPD3135-40LQXI_power_adapter project settings to support PD 3.0](#)

CCGx SDK Version 3.0.0 Changes

1. All reference projects are now provided as PSoC Creator Code examples and can be easily copied using PSoC Creator. All dependent files (src and lib) are now available under the project directory for ease of copying the projects.
2. CCGx (CCG3 and CCG4) Firmware Stack updated to version 3.0.0. The following are the changes in the CCGx Firmware stack:
 - a. Added CCG3 Charge-Through Dongle (CYPD3123-40LQXI) reference application supporting USB-PD specification revision 3.0.
 - b. Added support for CCG4PD3 (CYPD4126-40LQXI and CYPD4226-40LQXI) devices based on USB-PD specification revision 3.0.
 - c. USB-PD specification revision 3.0 support added for CCG3 Charge-Through Dongle (CYPD3123-40LQXI) and notebook (CYPD3125-40LQXI) reference applications.
 - d. Support optional features: fast role swap and PD extended messages.
3. CCG2 Firmware Stack updated to version 2.3.0. The following are the changes in the CCG2 Firmware stack:
 - a. Firmware stack updated to support USB PD Specification Revision 2.0 Version 1.2.
 - b. Firmware stack updated to support USB Type-C Specification Revision 1.2.

CCGx SDK Version 2.2.0 Changes

1. CCG3 device family support with CCGx Stack version 1.0.3. Added CYPD3120-40LQXI (DP Dongle) CYPD3125-40LQXI (Notebook), CYPD3135-40LQXI (Power Adapter) reference applications.
2. Updated CCG4 projects (CYPD4125-40LQXI and CYPD4225-40LQXI) to latest firmware stack.

CCGx SDK Version 2.1.0 Changes

1. CCG4 device family support with CCGx Stack version 1.0.0. Added CYPD4125-40LQXI (single port Notebook) and CYPD4225-40LQXI (dual port Notebook) reference applications.

CCGx SDK Version 2.0.0 Changes

1. Initial SDK release with CCG2 device family support with CCG2 Stack version 2.0.0.

Technical Support

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

Additional Information

For more information about the CCG4 Type-C controller, visit the web page:

<http://www.cypress.com/products/ez-pd-ccg4-two-port-usb-type-c-controller-power-delivery>

For more information about the CCG4 Evaluation Kit from Cypress, visit the web page:

<http://www.cypress.com/documentation/development-kitsboards/cy4541-ez-pd-ccg4-evaluation-kit>

For more information about the CCG3 Type-C controller, visit the web page:

<http://www.cypress.com/products/ez-pd-ccg3-type-c-port-controller-pd>

For more information about the CCG3 Evaluation Kit from Cypress, visit the web page:

<http://www.cypress.com/documentation/development-kitsboards/cy4531-ez-pd-ccg3-evaluation-kit>

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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