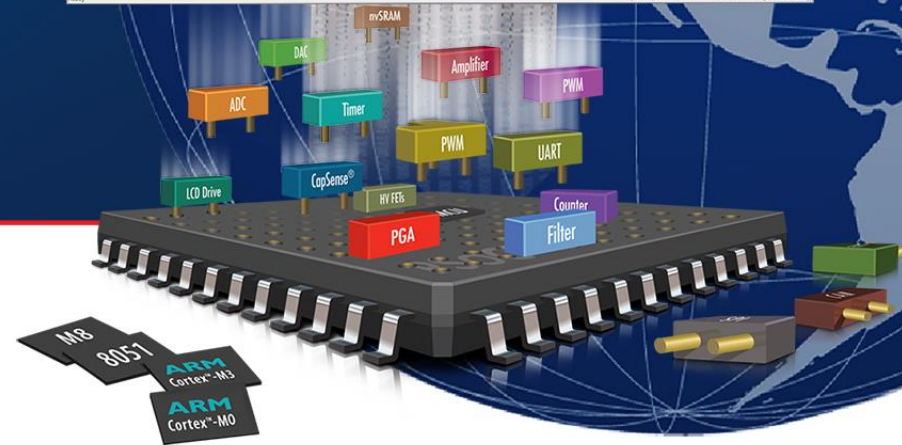
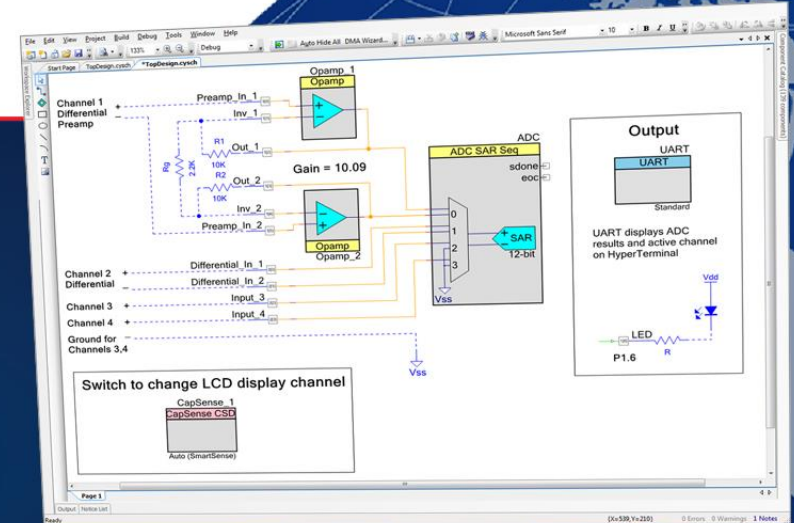


Solution Examples: EZ-PD™ CCG2



CCG2 Solution Example: Passive EMCA¹ With Two CCG2

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C cable plug

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via CC³ or SWD⁴
- Integrates transceiver, termination resistors, and ESD protection
- Available in 3.3-mm² CSP and 8.7-mm² DFN packages

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#), and [Reference Design](#)

Datasheet: [CCG2 Datasheet](#)

App Note: [Design USB 3.1 Type-C Cables Using CCG2](#)

Video: [Introduction to CCG2](#)

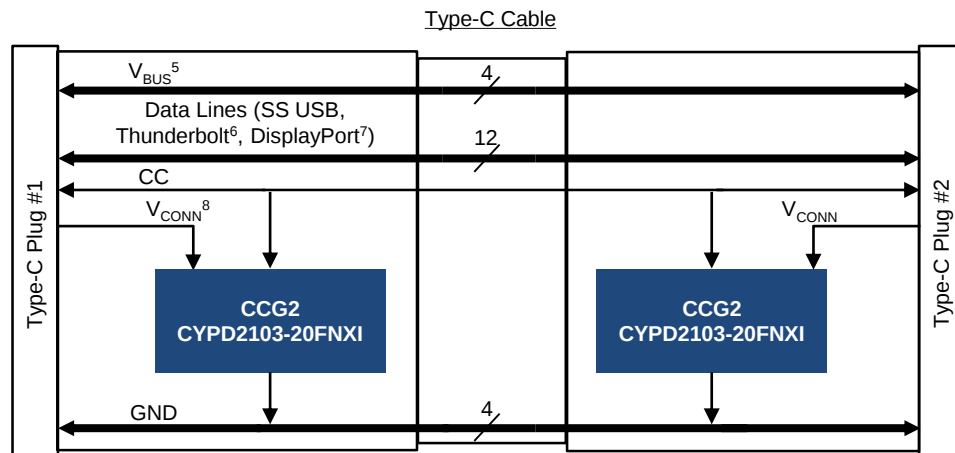
Demo Kit: [CY4502 EZ-PD CCG2 Development Kit](#)

How To Get Started

[Purchase a CY4502 EZ-PD CCG2 Development Kit](#)

Block Diagram

Passive EMCA With One CCG2 Per Cable Plug



Passive EMCA with CCG2

An EMCA that supports the PD protocol. A CCG2 is embedded at each end of the cable and is powered individually by the USB Type-C port at each end

¹ Electronically-marked cable assembly

² USB power delivery

³ Configuration channel

⁴ Single-wire debug port

⁵ The power wire of the USB bus

⁶ An interface jointly defined by Intel and Apple that connects peripherals to a computer; it uses the same connector as Mini DisplayPort

⁷ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁸ USB Type-C bus wire used to power the IC in the EMCA

CCG2 Solution Example: Passive EMCA¹ With One CCG2

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C cable plug

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via CC³ or SWD⁴
- Integrates transceiver, termination resistors, and ESD protection
- Available in 3.3-mm² CSP and 8.7-mm² DFN packages

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#) and [Reference Design](#)

Datasheet: [CCG2 Datasheet](#)

App Note: [Design USB 3.1 Type-C Cables Using CCG2](#)

Video: [Introduction to CCG2](#)

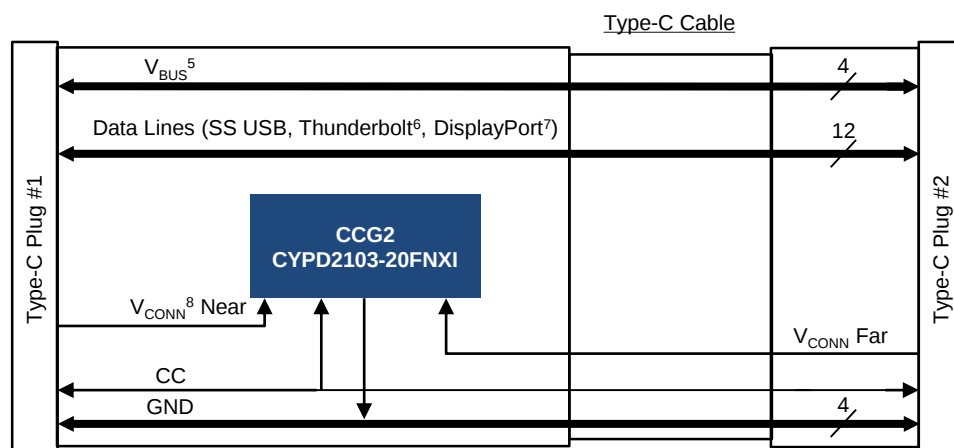
Demo Kit: [CY4502 EZ-PD CCG2 Development Kit](#)

How To Get Started

[Purchase a CY4502 EZ-PD CCG2 Development Kit](#)

Block Diagram

Passive EMCA With One CCG2 Per Cable



Passive EMCA with CCG2

A lower-cost implementation of EMCA that supports the PD protocol. A CCG2 is embedded at only one end of the cable and is powered by either USB Type-C port located at each end.

¹ Electronically marked cable assembly

² USB power delivery

³ Configuration channel

⁴ Single-wire debug port

⁵ The power wire of the USB bus

⁶ An interface jointly defined by Intel and Apple that connects peripherals to a computer; it uses the same connector as Mini DisplayPort

⁷ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁸ USB Type-C bus wire used to power the IC in the EMCA

CCG2 Solution Example: Active EMCA¹

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C cable plug

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via CC³ or SWD⁴
- Integrates transceiver, termination resistors, and ESD protection
- Available in 3.3-mm² CSP and 8.7-mm² DFN packages

Suggested Collateral

Webpages: [Type-C](#) and [CCG2](#)

Datasheet: [CCG2 Datasheet](#)

App Note: [Design USB 3.1 Type-C Cables Using CCG2](#)

Video: [Introduction to CCG2](#)

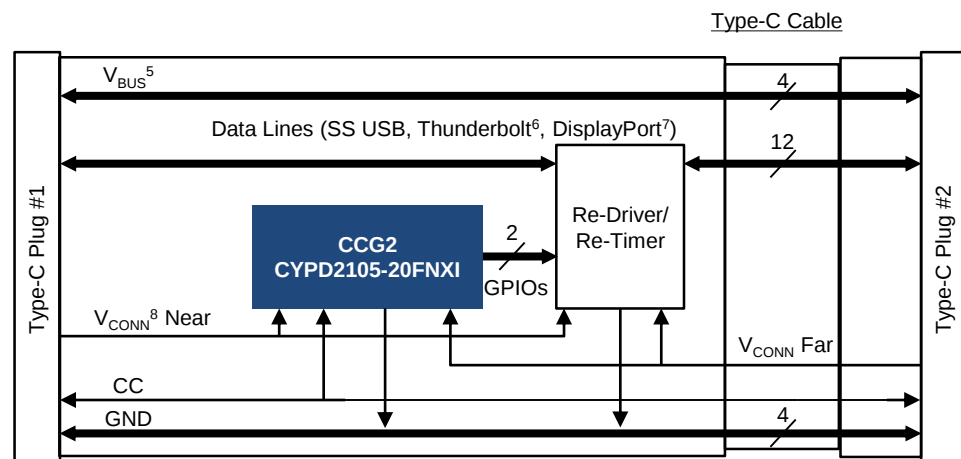
Demo Kit: [CY4502 EZ-PD CCG2 Development Kit](#)

How To Get Started

[Purchase a CY4502 EZ-PD CCG2 Development Kit](#)

Block Diagram

Active EMCA



Active EMCA with CCG2

An EMCA that includes an embedded re-driver to extend the cable length

¹ Electronically marked cable assembly with a re-driver

² USB power delivery

³ Configuration channel

⁴ Single-wire debug port

⁵ The power wire of the USB bus

⁶ An interface jointly defined by Intel and Apple that connects peripherals to a computer; it uses the same connector as Mini DisplayPort

⁷ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁸ USB Type-C bus wire used to power the IC in the EMCA

CCG2 Solution Example: USB Type-C to DisplayPort¹ Cable

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C-to-DisplayPort dongle

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Integrates transceiver, termination resistors, and ESD protection
- Available in 16-mm² QFN package

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#), and [Reference Design](#)

Datasheets: [CCG2 Datasheet](#), [USB Billboard Datasheet](#)

App Note: [Hardware Design Guidelines for CCG2](#)

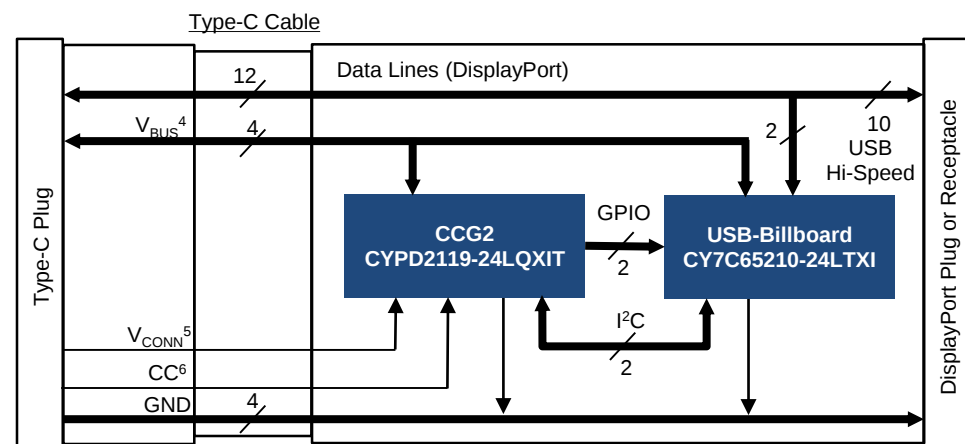
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C-to-DP¹ Dongle



USB Type-C DP Cable

A notebook PC accessory that converts a USB Type-C port to a DisplayPort output to connect a monitor

¹ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

² USB power delivery

³ Single-wire debug port

⁴ The power wire of the USB bus

⁵ USB Type-C bus wire used to power the IC in the EMCA

⁶ Configuration channel

CCG2 Solution Example: USB Type-C to HDMI¹ Dongle Solution



Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C-to-HDMI dongle

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Integrates transceiver, termination resistors, and ESD protection
- Available in 16-mm² QFN package

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#), and [Reference Design](#)

Datasheets: [CCG2 Datasheet](#), [USB Billboard Datasheet](#)

App Note: [Hardware Design Guidelines for CCG2](#)

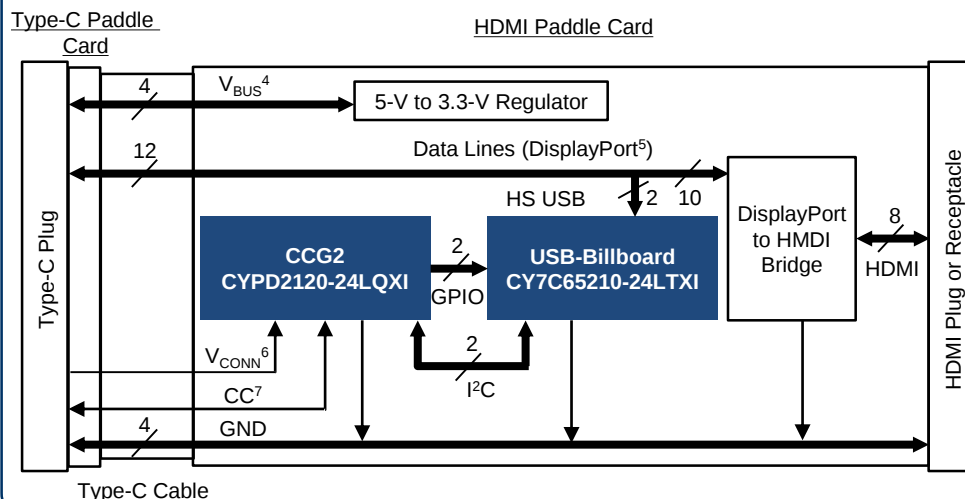
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C-to-HDMI Dongle



USB Type-C HDMI Dongle

A notebook PC accessory that converts a USB Type-C port to an HDMI output to connect a monitor



¹ High-definition multimedia interface

² USB power delivery

³ Single-wire debug port

⁴ The power wire of the USB bus

⁵ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁶ USB Type-C bus wire used to power the IC in the EMCA

⁷ Configuration channel

CCG2 Solution Example: USB Type-C to DVI¹ Dongle Solution

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C-to-DVI¹ dongle

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Integrates transceiver, termination resistors, and ESD protection
- Available in 16-mm² QFN package

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#), and [Reference Design](#)

Datasheets: [CCG2 Datasheet](#), [USB Billboard Datasheet](#)

App Note: [Hardware Design Guidelines for CCG2](#)

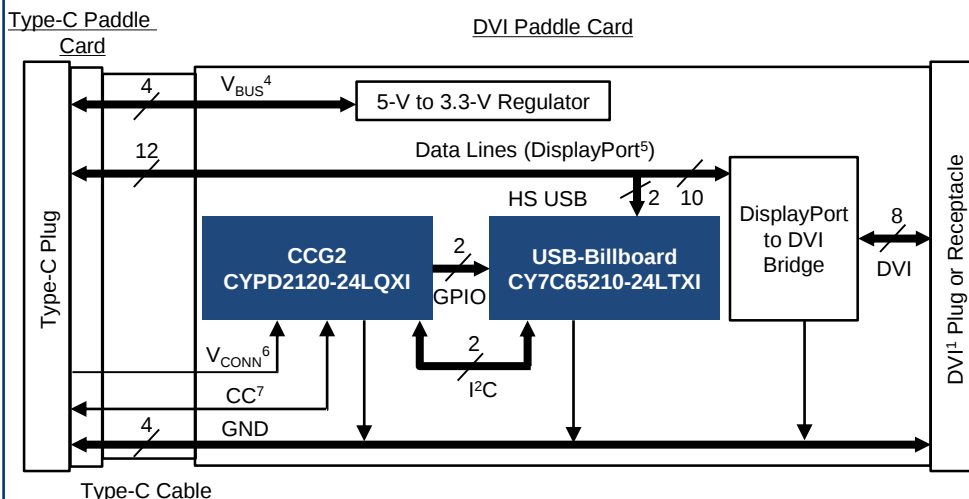
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C-to-DVI Dongle



USB Type-C DVI Dongle

A notebook PC accessory that converts a USB Type-C port to an DVI output to connect a monitor



¹ Digital video interface
² USB power delivery
³ Single-wire debug port

⁴ The power wire of the USB bus
⁵ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁶ USB Type-C bus wire used to power the IC in the EMCA
⁷ Configuration channel

CCG2 Solution Example: USB Type-C to VGA¹ Dongle Solution

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD² and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Meet low BOM requirement
- Fit inside a Type-C-to-VGA dongle

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Integrates transceiver, termination resistors, and ESD protection
- Available in 16-mm² QFN package

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#), and [Reference Design](#)

Datasheets: [CCG2 Datasheet](#), [USB Billboard Datasheet](#)

App Note: [Hardware Design Guidelines for CCG2](#)

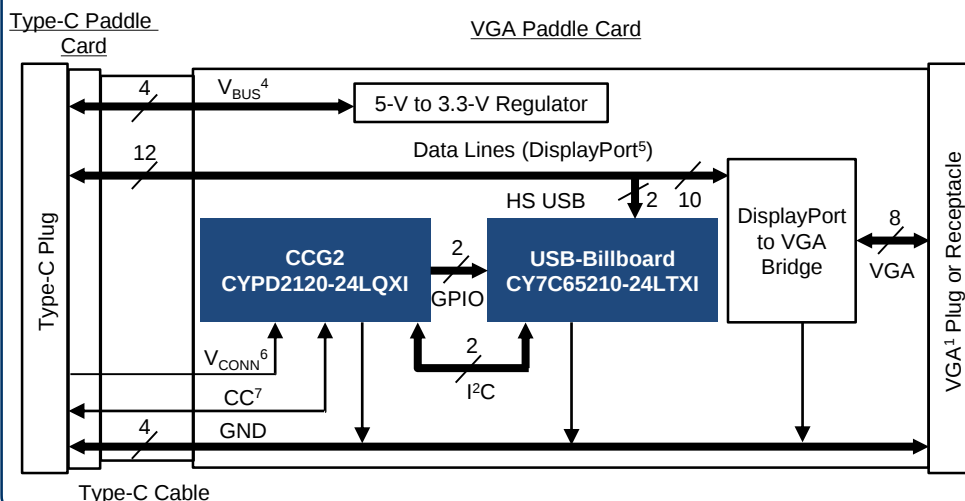
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C-to-VGA Dongle



USB Type-C VGA Dongle

A notebook PC accessory that converts a USB Type-C port to an VGA output to connect a monitor



¹ Video graphics array
² USB power delivery
³ Single-wire debug port

⁴ The power wire of the USB bus

⁵ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁶ USB Type-C bus wire used to power the IC in the EMCA

⁷ Configuration channel

CCG2 Solution Example: Type-C Power Adapter

Cypress Solution Value

Design Challenges

Power adapter designers want a Type-C solution now
Short time-to-market demands programmable solutions
Must be turnkey for ease-of-design
Must be highly integrated to lower BOM cost
Must be reprogrammable to keep up with USB-IF standards
Industry standards demand low power for no-load conditions

CCG2 Solution

Provides Type-C solution with Power Delivery (PD)¹
Includes an Arm[®] Cortex[®]-M0 with 32KB flash
Ships with USB-IF-compliant factory-programmed firmware
Integrates Type-C transceiver, termination resistors, and system ESD protection
Supports field upgrades with free, fully-compliant firmware
Delivers low power: Deep Sleep² 2.5 μ A

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#) and [Reference Design](#)

Datasheet: [CCG2 Datasheet](#)

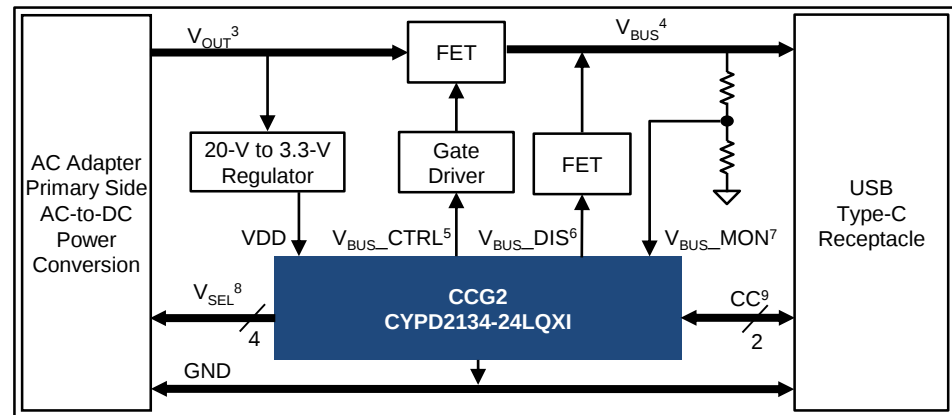
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for CCG2 Development board

Block Diagram

Type-C Power Adapter with CCG2



USB Type-C Cable



New Smartphone Charger with
USB Type-C Receptacle

CCG2 supports the PD
controller and supplies DC
voltage



¹ USB power delivery

² Low power state where high-frequency clocks are shut down

³ DC output voltage of the AC adapter

⁴ The power wire of the USB bus

⁵ Signal to control V_{BUS} load

⁶ Signal to control V_{BUS} discharge FET

⁷ V_{BUS} monitoring node for overvoltage and undervoltage protection

⁸ Output voltage selection

⁹ Configuration channel

CCG2 Solution Example: Type-C Car Charger

Cypress Solution Value

Design Challenges

Car charger designers want a Type-C solution now
Short time-to-market demands programmable solutions
Must be turnkey for ease-of-design
Must be highly integrated to lower BOM cost
Must be reprogrammable to keep up with USB-IF standards
Industry standards demand low power for no-load conditions

CCG2 Solution

Provides Type-C solution with Power Delivery (PD)¹
Includes an Arm® Cortex®-M0 with 32KB flash
Ships with USB-IF-compliant factory-programmed firmware
Integrates Type-C transceiver, termination resistors, and system ESD protection
Supports field upgrades with free, fully-compliant firmware
Delivers low power: Deep Sleep² 2.5 μ A

Suggested Collateral

Webpages: [Type-C](#), [CCG2](#) and [Reference Design](#)

Datasheet: [CCG2 Datasheet](#)

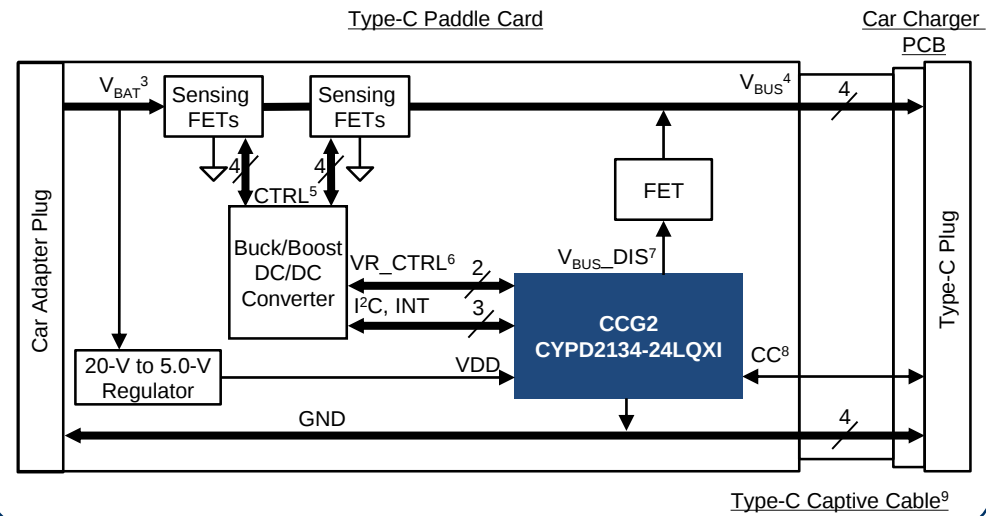
Video: [Introduction to CCG2](#)

How To Get Started

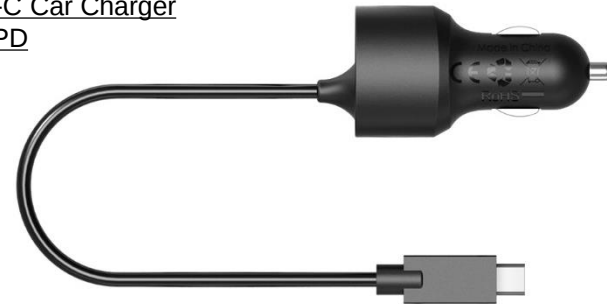
[Contact Sales](#) for CCG2 Development board

Block Diagram

Type-C Car Charger with CCG2



USB Type-C Car Charger with USB-PD



¹ A new USB standard that increases power delivery over V_{BUS} from 7.5 W to 100 W

² Low power state where high-frequency clocks are shut down

³ DC output voltage of the car battery and alternator

⁴ The power wire of the USB bus

⁵ Signals for V_{BUS} current sensing (CSP, CSN), high-side gate drive (HGATE), and low-side gate drive (LGATE)

⁶ Control signals for the voltage regulator including current limit and enable

⁷ Signal to control V_{BUS} discharge FET

⁸ Configuration channel

⁹ A cable permanently attached to the car charger

CCG2 Solution Example: USB Type-C Notebook

Cypress Solution Value

Design Challenges

Develop firmware for USB PD¹ and Billboard protocol
Upgrade firmware to keep up with USB-IF standard changes
Meet low BOM requirement
Use one Type-C connector for data, video, and power

CCG2 Solution

Ships with USB-IF-certified factory-programmed firmware
Supports firmware upgrade via I²C or SWD²
Integrates transceiver, termination resistors, and ESD protection
Routes USB 3.0 signals, DisplayPort³ signals, and 100 W over a Type-C cable and connector

Suggested Collateral

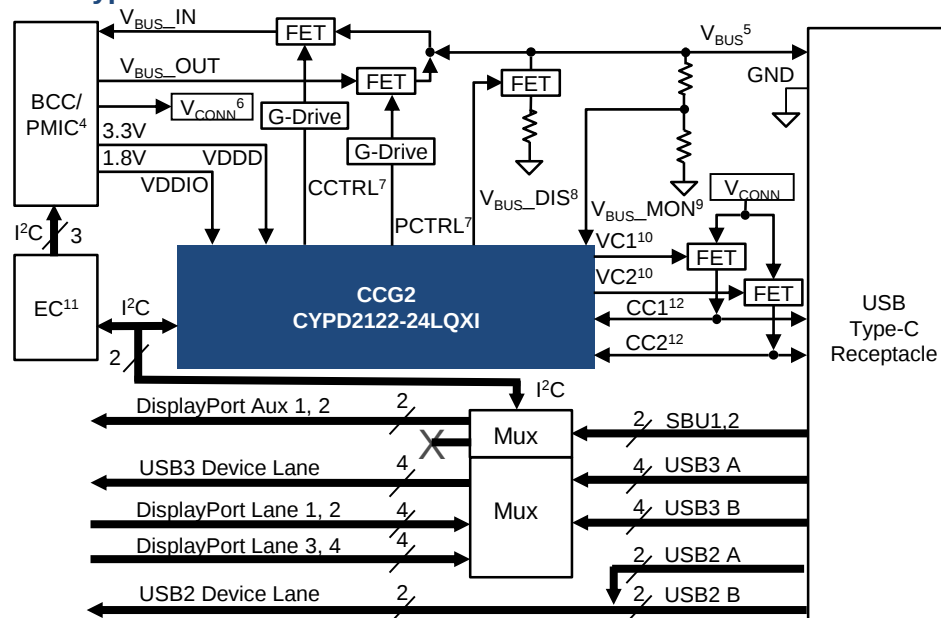
Webpages: [Type-C](#) and [CCG2](#)
Datasheet: [CCG2 Datasheet](#)
Video: [Introduction to CCG2](#)

How To Get Started

[Contact Sales](#) for CCG2 Host Development board

Block Diagram

USB Type-C Notebook with CCG2



Type-C Notebook with CCG2

CCG2 supports both PD provider and consumer roles, allowing a notebook to provide power to or consume power from its Type-C port



¹ USB power delivery

² Single-wire debug port

³ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁴ Battery charge controller/Power Management IC

⁵ The power wire of the USB bus

⁶ The power wire of the USB Type-C bus that is used to power the IC in the EMCA

⁷ Signal to control the provider, consumer V_{BUS} load

⁸ Signal to control V_{BUS} discharge FET

⁹ V_{BUS} monitoring node for over and undervoltage protection

¹⁰ V_{CONN} control signal to turn on V_{CONN}

¹¹ Embedded Controller

¹² Configuration channel

CCG2 Solution Example: USB Type-C Monitor

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD¹ and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Support USB PD, BC1.2² and Apple charging
- Meet low BOM requirement
- Use one Type-C connector for data, video, and power

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Supports all USB charging standards with CCG2 and HX3
- Integrates transceiver, termination resistors, and ESD protection
- Routes USB 3.0 signals, DisplayPort⁴ signals, and 100 W over a Type-C cable and connector

Suggested Collateral

Datasheets: [CCG2 Datasheet](#), [HX3 Datasheet](#), and [USB Billboard Datasheet](#)

App Notes: [Design USB 3.1 Type-C Cables Using CCG2](#) and [HX3 Hardware Design Guide](#)

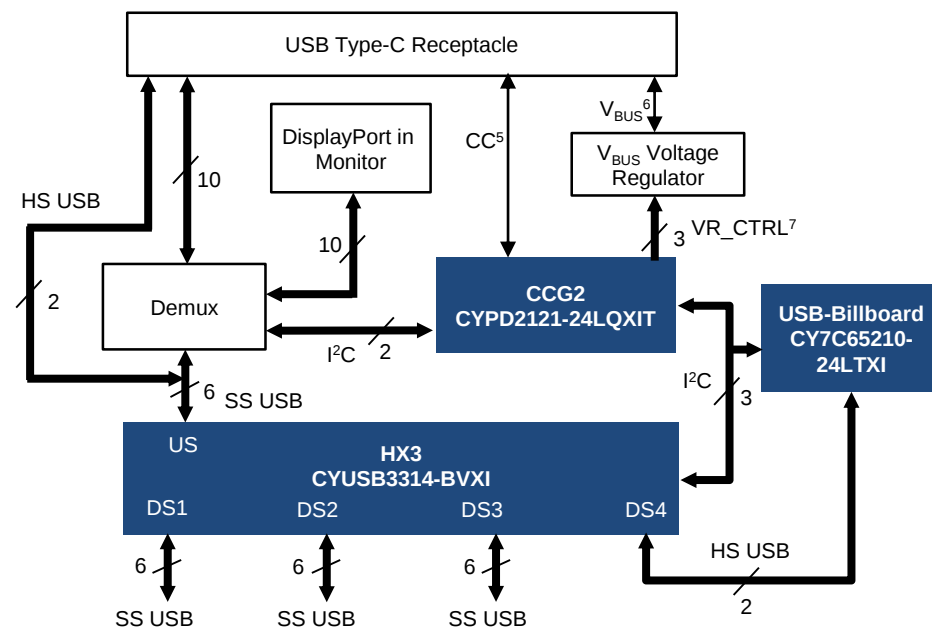
Demo Kits: [CCG2 Notebook/Monitor Demo Kit](#) and [HX3 CY4603 DVK](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C Monitor



Type-C Monitor with CCG2, HX3, and USB Billboard

A solution supporting all PD profiles and data routing control



¹ USB power delivery

² USB Battery Charging Specification Version 1.2

³ Single-wire debug port

⁴ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁵ Configuration channel

⁶ The power wire of the USB bus

⁷ Signals to control voltage regulator

CCG2 Solution Example: USB Type-C HDMI Multiport Adapter

Cypress Solution Value

Design Challenges

- Develop firmware for USB PD¹ and Billboard protocol
- Upgrade firmware to keep up with USB-IF standard changes
- Support USB PD, BC1.2² and Apple charging
- Meet low BOM requirement
- Use one Type-C connector for data, video, and power

CCG2 Solution

- Ships with USB-IF-certified factory-programmed firmware
- Supports firmware upgrade via I²C or SWD³
- Supports all USB charging standards with CCG2 and HX3
- Integrates transceiver, termination resistors, and ESD protection
- Routes USB 3.0 signals, DisplayPort⁴ signals, and 100 W over a Type-C cable and connector

Suggested Collateral

Datasheets: [CCG2 Datasheet](#), [HX3 Datasheet](#), and [USB Billboard Datasheet](#)

App Notes: [Design USB 3.1 Type-C Cables Using CCG2](#) and [HX3 Hardware Design Guide](#)

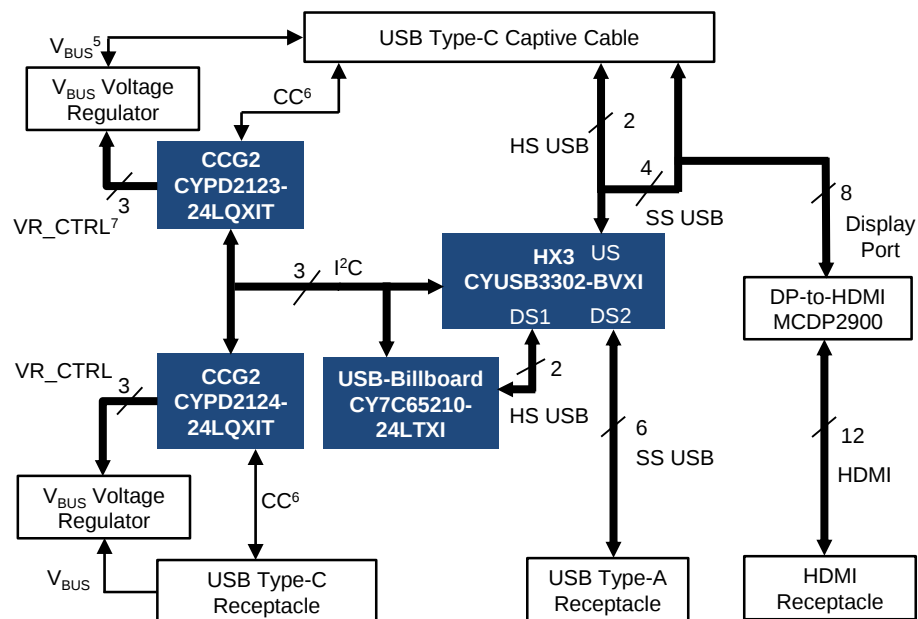
Demo Kits: [CCG2 Notebook/Monitor Demo Kit](#) and [HX3 CY4603 DVK](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C HDMI Multiport Adapter



Type-C to HDMI Multiport Adapter with CCG2, HX3 and USB Billboard

Solution can either be powered by tablet or charge tablet when downstream Type-C is connected to AC power adapter



¹ USB power delivery

² USB Battery Charging Specification Version 1.2

³ Single-wire debug port

⁴ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁵ The power wire of the USB bus

⁶ Configuration channel

⁷ Signals to control voltage regulator

CCG2 Solution Example: USB Type-C Charging Dock

Cypress Solution Value

Design Challenges

Develop firmware for USB PD¹ and Billboard protocol
Upgrade firmware to keep up with USB-IF standard changes
Support USB PD¹, BC1.2², and Apple charging
Meet low BOM requirement
Use one Type-C connector for data, video, and power

CCG2 Solution

Ships with USB-IF-certified factory-programmed firmware
Supports firmware upgrade via I²C or SWD³
Supports all USB charging standards with CCG2 and HX3
Integrates transceiver, termination resistors, and ESD protection
Routes USB 3.0 signals, DisplayPort⁴ signals, and 100 W over a Type-C cable and connector

Suggested Collateral

Datasheets: [CCG2 Datasheet](#), [HX3 Datasheet](#),
[GX3 Datasheet](#) and [USB Billboard Datasheet](#)

App Notes: [Design USB 3.1 Type-C Cables Using CCG2](#)
and [HX3 Hardware Design Guide](#)

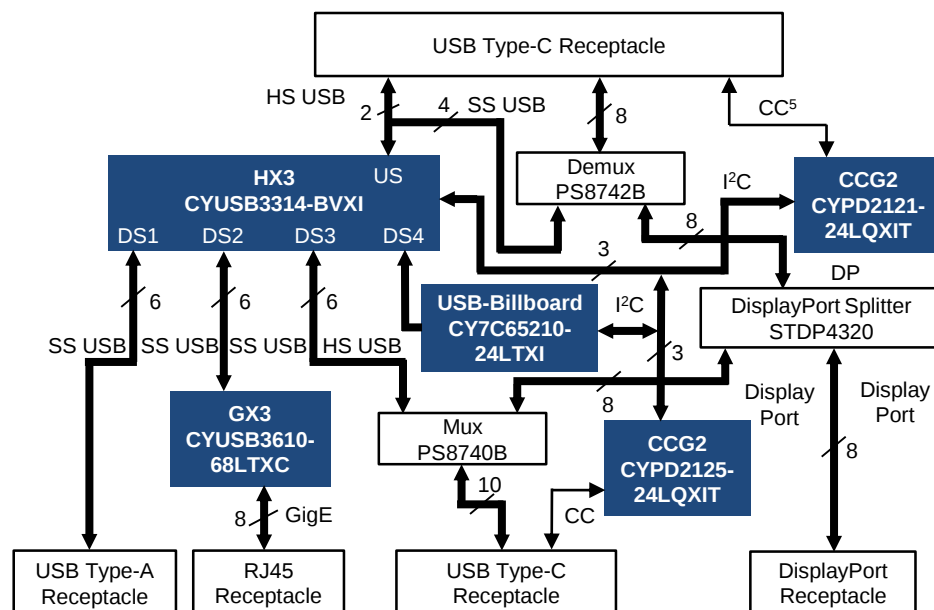
Demo Kits: [CCG2 Notebook/Monitor Demo Kit](#) and
[HX3 CY4603 DVK](#)

How To Get Started

[Contact Sales](#) for Type-C reference design

Block Diagram

USB Type-C Charging Dock



USB Type-C Charging Dock with CCG2, HX3, GX3 and USB Billboard

Solution is powered by a 24 V @ 4-A power adapter and can provide up to 20 V @ 2 A on upstream Type-C port and 5 V @ 3 A on downstream Type-C port

¹ USB power delivery

² USB Battery Charging Specification Version 1.2

³ Single-wire debug port

⁴ A display interface standard developed by the Video Electronics Standards Association used primarily to connect a video source to a display such as a computer monitor

⁵ Configuration channel