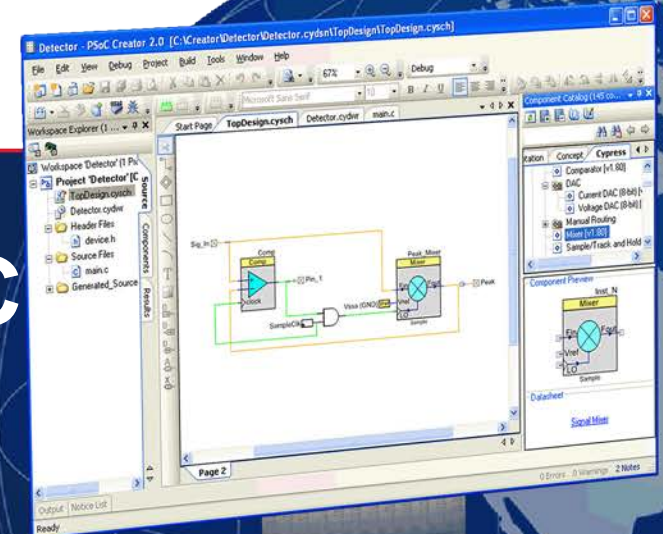


Quick Presentation: EZ-PD CCG1: USB Type-C Port Controller With PD

CCG1 = Type-C Controller Gen1
Type-C = New USB Connector Standard
PD = Power Delivery

Don't Miss the Rapid Change Over to the New,
Slimmer, All-in-One, 100-W, Type-C Connector



USB Type-C: Connector of the Future

USB Type-A and Type-B are the current USB-IF¹ standards, but they have limitations

They use large connectors that prevent slim industrial designs (plug height: A = 4.5 mm; B = 10.4 mm)

They require a fixed plug orientation and a fixed cable direction

They carry only USB signals

Power delivery implementation on them is complicated, expensive and limited to 7.5 W

USB Type-C is the new USB-IF¹ standard that solves these problems and enables:

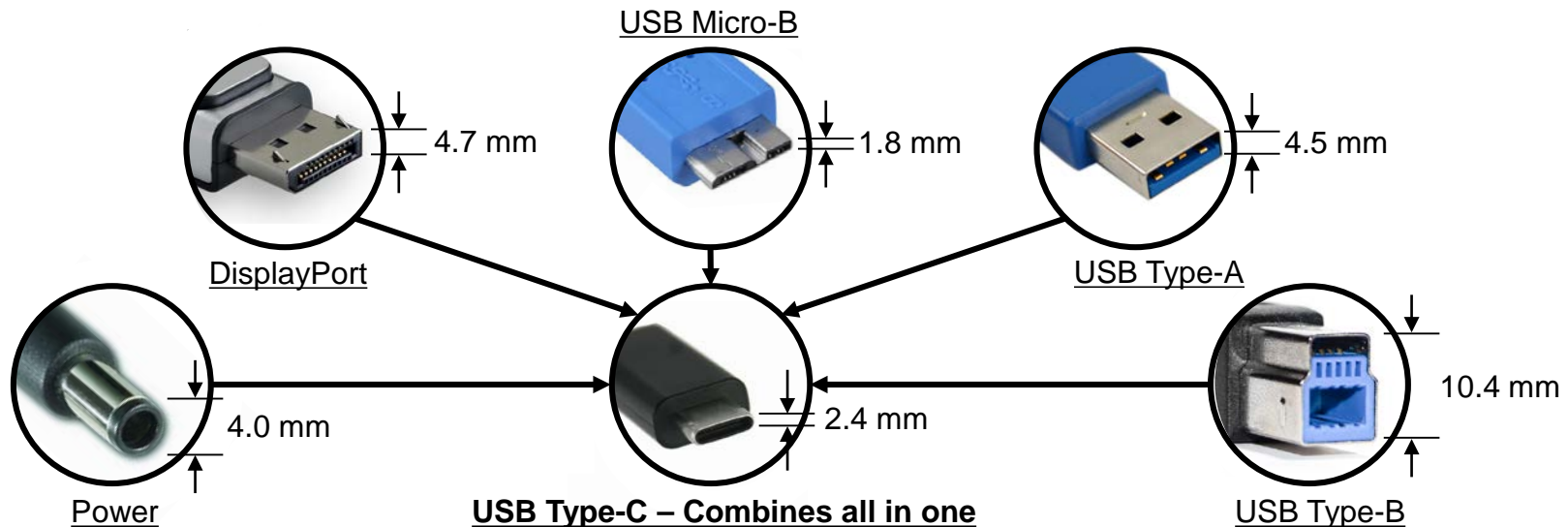
Slim industrial design with a 2.4-mm plug height

Reversible plug orientation and cable direction

Transport of both USB signals and PCIe or DisplayPort signals on the same connector

Easy implementation of low-cost USB Power Delivery up to 100 W

USB Type-C is the new, slimmer, all-in-one, 100-W connector



¹ The USB Implementers Forum creates and maintains USB specifications

² Peripheral Component Interconnect Express is a standard for the primary bus in PCs

USB Type-C Port Controller Market Will Grow to \$350M by 2019



USB Type-C port controllers are projected to grow from \$65M in 2015 to \$350M in 2019—a 40% CAGR

The USB Type-C port is universal: it is slimmer, reversible, handles multiple protocols and supports up to 100-W PD

Every PD-capable, multiple-protocol USB Type-C port requires a dedicated controller

This market requires a USB-IF¹ certified solution that:

Marks cables electronically with a controller IC embedded in the cable plug to report the cable's characteristics (e.g., current rating)

Multiplexes USB signals with PCIe² or DisplayPort³ signals on the same connector

Supports all Power Delivery profiles⁴ up to 100 W, for notebooks, tablets, monitors, USB cables and power adapters

Cypress has been “Making USB Universal®” since 1996

Cypress has shipped over 1.4 billion USB controllers

Cypress has been a leading supplier in every generation of USB technology: USB 1.1, USB 2.0 and USB 3.0

Accelerate your conversion to USB Type-C and PD with Cypress’s CCG1 Type-C port controller

Products That Will Require Type-C Port Controllers



Notebook



Tablet



Monitor



Cable



Power Adapter

¹ The USB Implementers Forum creates and maintains USB specifications

² Peripheral Component Interconnect Express is a standard for the primary bus in PCs

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 monitor

⁴ A USB-IF specified combination of voltage and current ratings that define the power provided (e.g., 20 V and 5 A: 100-W power provided)

CCG1 Simplifies Design, Reduces BOM

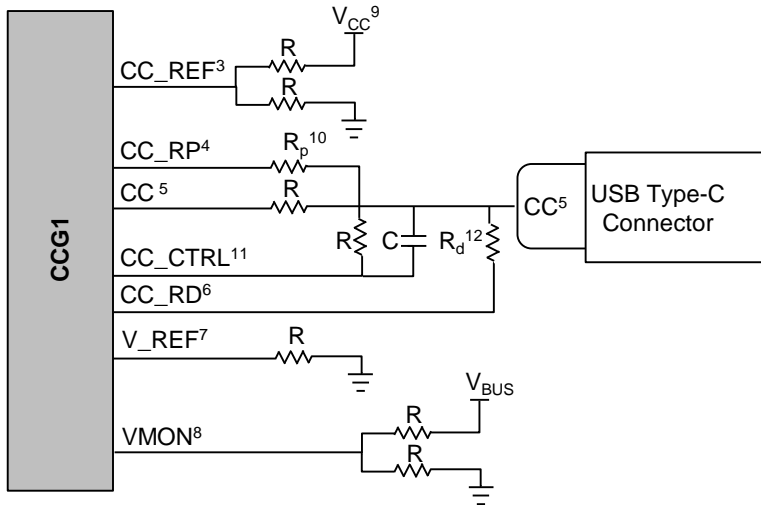


Integrated Type-C transceivers, OVP¹ and OCP² circuitry simplify system design and reduce BOM cost

MCU-based solutions require external comparators to support Type-C signaling and overvoltage protection

MCU-based solutions implement the Type-C transceiver in firmware, requiring engineering effort and additional memory

CCG1 Type-C Port Controller With Integrated Type-C Transceivers



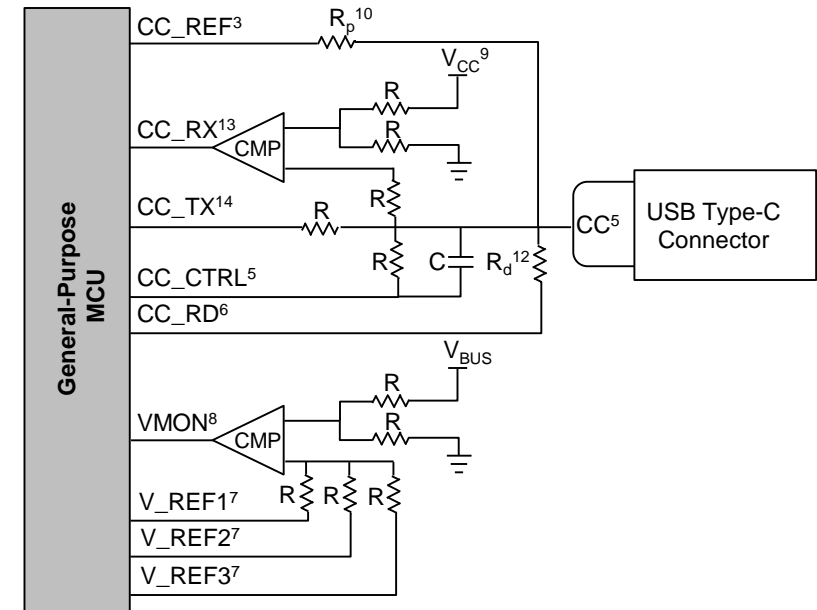
External components

9 resistors
1 capacitor
0 comparators

Firmware development

Not required

MCU-Based Solutions



External components

12 resistors
1 capacitor
2 comparators

Firmware development

Required

- ¹ Overvoltage protection
- ² Overcurrent protection
- ³ Reference voltage used to detect the value of the Configuration Channel (CC)
- ⁴ A control signal that is driven HIGH when there is a downstream-facing port

- ⁵ Configuration Channel: USB Type-C bus wire used to carry the PD protocol signals
- ⁶ A control signal that is driven LOW when there is an upstream-facing port
- ⁷ A reference voltage used to check for overvoltage
- ⁸ The bus voltage that is compared with the reference voltage

- ⁹ The I/O voltage of Type-C bus wire
- ¹⁰ A termination resistor denoting a downstream-facing port
- ¹¹ A control signal that is driven LOW to transmit data
- ¹² A termination resistor denoting an upstream-facing port
- ¹³ The receive signal of the CC
- ¹⁴ The transmit signal of the CC

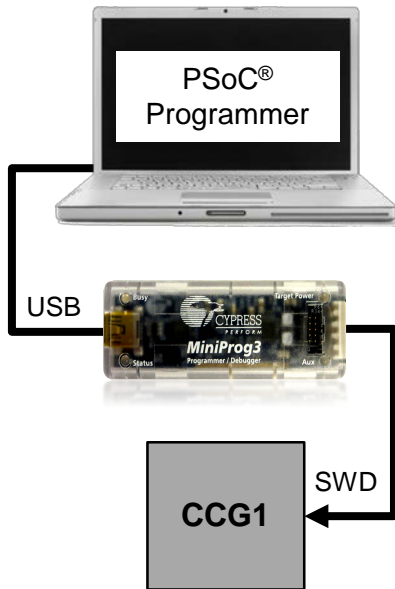
CCG1 Is Programmable and Upgradable



CCG1 can be upgraded to keep pace with changes in the USB-IF¹ specification

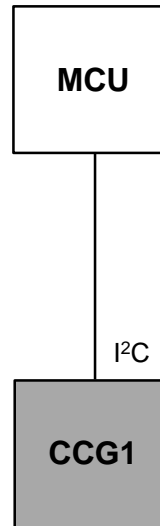
The ARM[®] Cortex[®]-M0 and 32KB flash can be programmed anytime, anywhere using its Serial Wire Debug (SWD), I²C or CC² wires

Upgrading CCG1 Using SWD



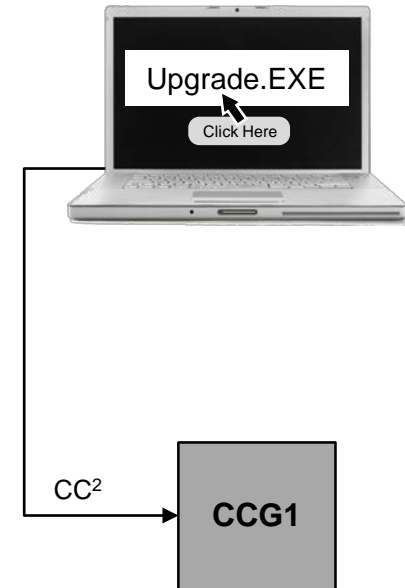
Run PSoC Programmer software on a PC with a MiniProg3 USB dongle to program the CCG1. Typically used during product development.

Upgrading CCG1 Using I²C



Use an MCU embedded in the USB Type-C cable/accessory or a production tester to program CCG1. Can be used on the production line or in the field.

Upgrading CCG1 Using CC²



Use a PC running a firmware upgrade application to program CCG1 in the USB Type-C cable directly. Can be deployed by cable manufacturers to provide upgrades to the end user.

¹ The USB Implementers Forum creates and maintains USB specifications

² Configuration Channel: USB Type-C bus wire used to carry the PD protocol signals

CCG1 Solution Example: USB Type-C to DisplayPort (DP¹) Cable



Cypress Solution Value

Design Challenges

Legacy displays have DP¹ and not Type-C
Type-C to DP¹ adapter solutions are needed
Solutions must be turnkey for ease of design
Solutions must be flexible to keep up with USB-IF² standards
Solutions must be highly integrated to lower BOM cost
Solutions must be in a package that fits in a cable assembly

CCG1 Solution

Supports Type-C to DP¹ with an ARM[®] Cortex[®]-M0 controller
Supports PD protocol for Type-C to DP¹ with the 32KB flash
Ships with USB-IF² compliant factory-programmed firmware
Supports field upgrades with free, fully compliant firmware
Integrates Type-C transceiver, supports multiple protocols
Available in 35-ball CSP (6.8 mm²) and 40-pin QFN (25 mm²)

Suggested Collateral

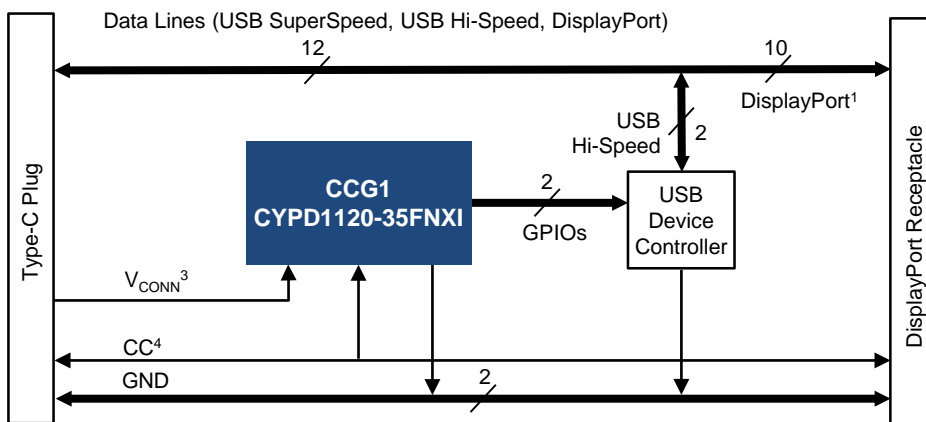
Datasheet: [CCG1 Datasheet](#)
Demo Kit: [CCG1 Client Demo Kit](#)
Video: [CCG1 Demo Video](#)

How To Get Started

Get a [CCG1 Client Demo Kit](#)

Block Diagram

USB Type-C DP¹ Dongle



USB Type-C DP¹ Cable

A notebook PC accessory that converts a USB Type-C port to a DP¹ output to connect a monitor



¹ A display interface standard developed by the Video Electronics Standards

² The USB Implementers Forum creates and maintains USB specifications

³ USB Type-C bus wire used to power the IC in the EMCA

⁴ Configuration Channel is the USB Type-C bus wire used to carry the PD protocol signals

CCG1 Solution Example: Type-C Power Adapter

Cypress Solution Value

Design Challenges

Notebook designers want a Type-C solution now
Short time-to-market demands programmable solutions
Solutions must be turnkey for ease of design
Solutions must be highly integrated to lower BOM cost
Solutions must be flexible to keep up with USB-IF¹ standards
Industry standards demand low power for no-load conditions

CCG1 Solution

Provides Type-C solution with PD² today
Includes an ARM[®] Cortex[®]-M0 with 32KB flash
Ships with USB-IF¹ compliant factory-programmed firmware
Integrates Type-C transceiver and OVP³, OCP⁴ circuitry
Supports field upgrades with free, fully compliant firmware
Delivers low power: Deep Sleep 1.3 μ A

Suggested Collateral

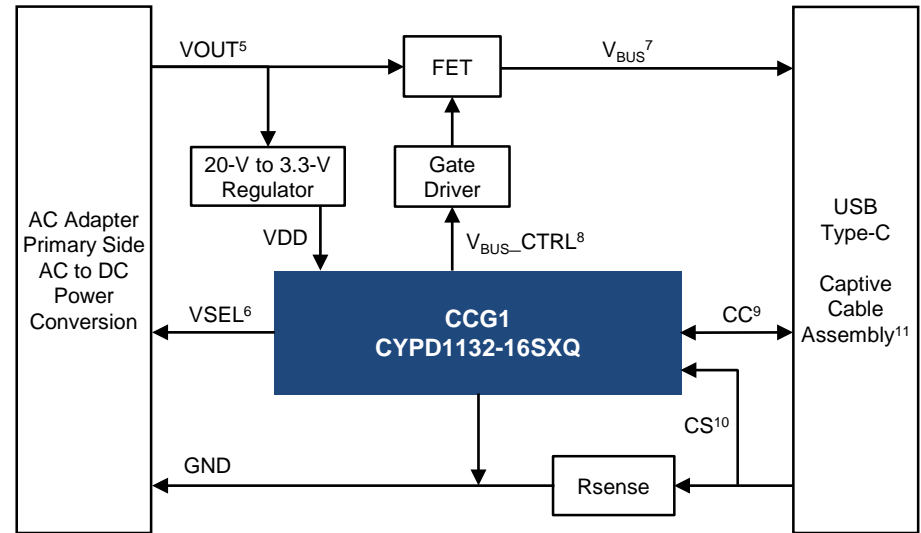
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Block Diagram

Type-C Power Adapter With CCG1



Type-C Power Adapter With CCG1

CCG1 supports all PD profiles required for a 100-W power adapter



⁶ Output voltage selection

⁷ The power wire of the USB bus

⁸ Signal to control V_{BUS} load

⁹ Configuration Channel is the USB Type-C bus

wire used to carry the PD protocol signals

¹⁰ Current-sensing input

¹¹ A cable permanently attached to the AC adapter

¹ The USB Implementers Forum creates and maintains USB specification

² A new USB standard that increases power delivery over V_{BUS} from 7.5 W to 100 W

³ Overvoltage protection

⁴ Overcurrent protection

⁵ DC output voltage of the AC adapter