AN1505: CP2101/2/3/4/9/2N to CP2102C Porting Guide

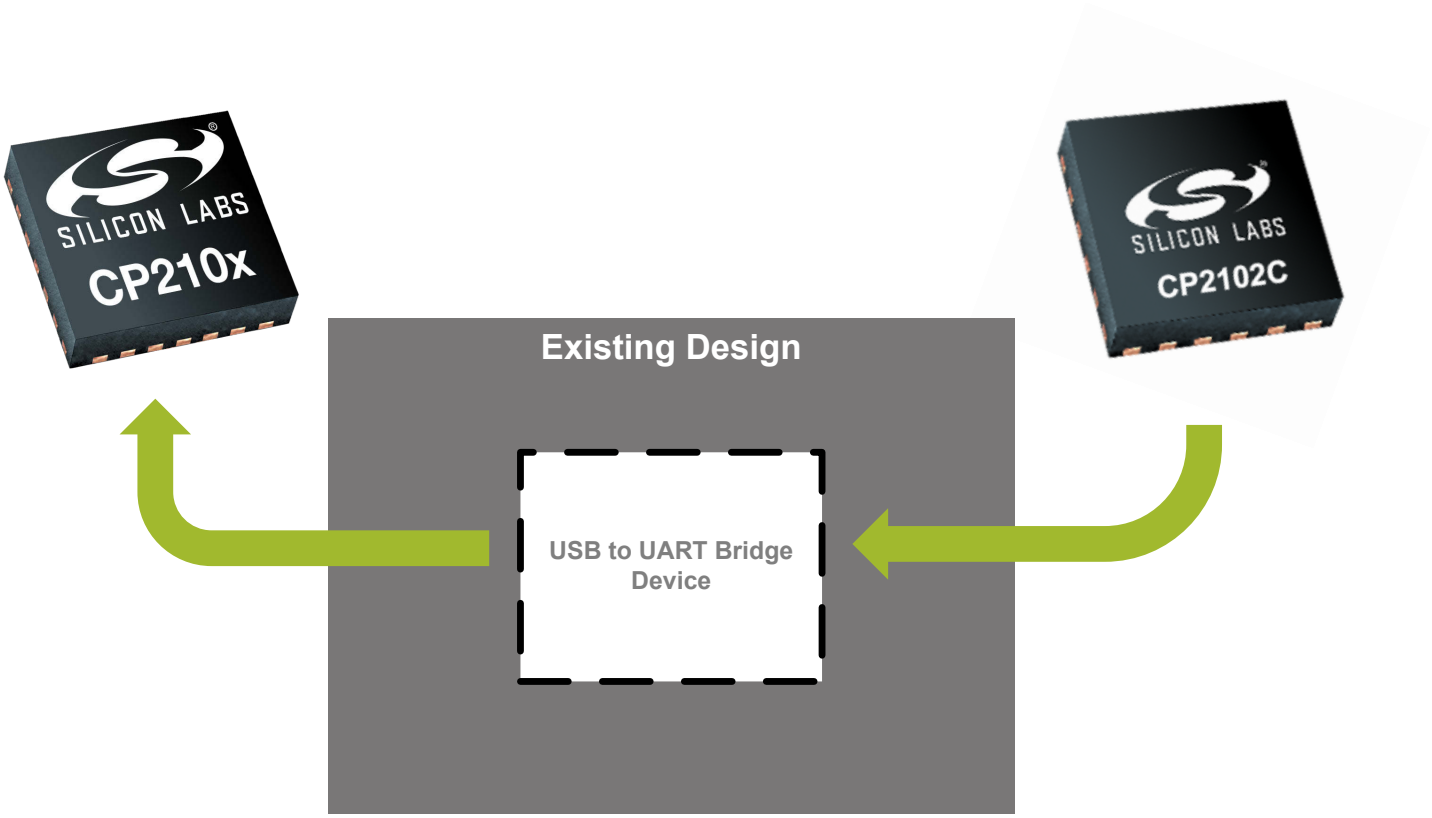
The CP2102C device is designed to act as a USB to UART bridge that works with the default CDC driver provided by the Operating System. This device can be used to replace existing single-interface CP210x USB-to-UART devices without installing any drivers.

For some devices, such as the CP2102, CP2102N, and CP2104, the CP2102C is virtually a drop in replacement. Apart from the addition of two resistors, no other hardware changes or software are required to use the CP2102C in existing designs. For other devices, slight package or feature differences may require minor changes to hardware. This application note describes in detail the steps required to integrate a CP2102C device into a design in place of a previous CP210x device.

Devices covered by this application note are: CP2101, CP2102/9, CP2103, CP2104, and CP2102N. The multiple-interface devices, such as the CP2105 and CP2108, are not discussed.

KEY POINTS

- The CP2102C maintains a high degree of UART feature compatibility with most existing CP210x devices.
- Design will require minimal hardware changes when migrating to the CP2102C.
- The CP2102C provides a migration path for:
  - CP2101
  - CP2102/9
  - CP2103
  - CP2104
  - CP2102N



1. Device Comparison

1.1 Feature Compatibility

The table below provides a full feature comparison table for all CP210x devices, including the CP2102C. In general, the CP2102C meets or exceeds the feature set of all previous CP210x devices.

Table 1.1. CP210x Family Features

Feature	CP2101	CP2102	CP2109	CP2103	CP2104	CP2102N	CP2102C
Re-programmable	X	X		X		X	
One-time-programmable			X		X		
UART Features							
Max Baud Rate	921.6kbps	921.6kbps	921.6kbps	921.6kbps	921.6kbps	3Mbps	3Mbps
Data Bits: 8	X	X	X	X	X	X	X
Data Bits: 5, 6, 7		X	X	X	X	X	X
Stop Bits: 1	X	X	X	X	X	X	X
Stop Bits: 1.5, 2		X	X	X	X	X	X
Parity Bit: Odd, Even, None	X	X	X	X	X	X	X
Parity Bit: Mark, Space		X	X	X	X	X	X
Hardware Handshake	X	X	X	X	X	X	X[1]
X-ON/X-OFF Handshake	X	X	X	X	X	X	
Event Character Support	X	X	X			X	
Line Break Transmission		X	X		X	X	X[2]
Baud Rate Aliasing		X	X	X			
Driver Support							
Virtual COM Port Driver	X	X	X	X	X	X	
USBXpress Driver	X	X	X	X	X	X	
Other Features							
RS-232 Support	X	X	X	X	X	X	X
RS-485 Support				X	X	X	
GPIOs	None	None	None	4	4	4-7	None
Battery Charger Detect						X	
Remote Wake-up						X	
Clock Output						X	

Note:

1. Because the hardware handshake is default enabled, we recommend connecting CTS with a weak pull down resistor so that the device can still work normally if the pins are not fully connected (RTS, CTS).
2. The CP2102C supports break signaling with an external 10 kOhm resistor between TXD and ground.

1.2 Pin Compatibility

With the exception of its VBUS pin, which must be connected to a voltage divider for proper operation, the CP2102C is largely pin-compatible with most CP210x devices. Below is a table of variants of the CP2102C that can be used to replace previous CP210x devices.

Table 1.2. CP2102C Replacements for CP210x Devices

CP210x Device	Pin-Compatible Replacement
CP2101	CP2102C-A01-GQFN28
CP2102/9	CP2102C-A01-GQFN28
CP2103	None (refer to for migration considerations)
CP2104	CP2102C-A01-GQFN24
CP2102N	CP2102C-A01-GQFN24 / CP2102C-A01-GQFN28

As the CP2102C datasheet notes, there are two relevant restrictions on the VBUS pin voltage in self-powered and bus-powered configurations. The first is the absolute maximum voltage allowed on the VBUS pin, which is defined as VIO + 2.5 V in Absolute Maximum Ratings table. The second is the input high voltage (VIH) that is applied to VBUS when the device is connected to a bus, which is defined as VIO – 0.6 V in the table of GPIO specifications.

A resistor divider (or functionally-equivalent circuit) on VBUS, as shown in Figure 1.1 Bus-Powered Connection Diagram for USB Pins on page 3 and Figure 1.2 Self-Powered Connection Diagram for USB Pins on page 4 for bus- and self-powered operation, respectively, is required to meet these specifications and ensure reliable device operation. In this case, the current limitation of the resistor divider prevents high VBUS pin leakage current, even though the VIO + 2.5 V specification is not strictly met while the device is not powered.

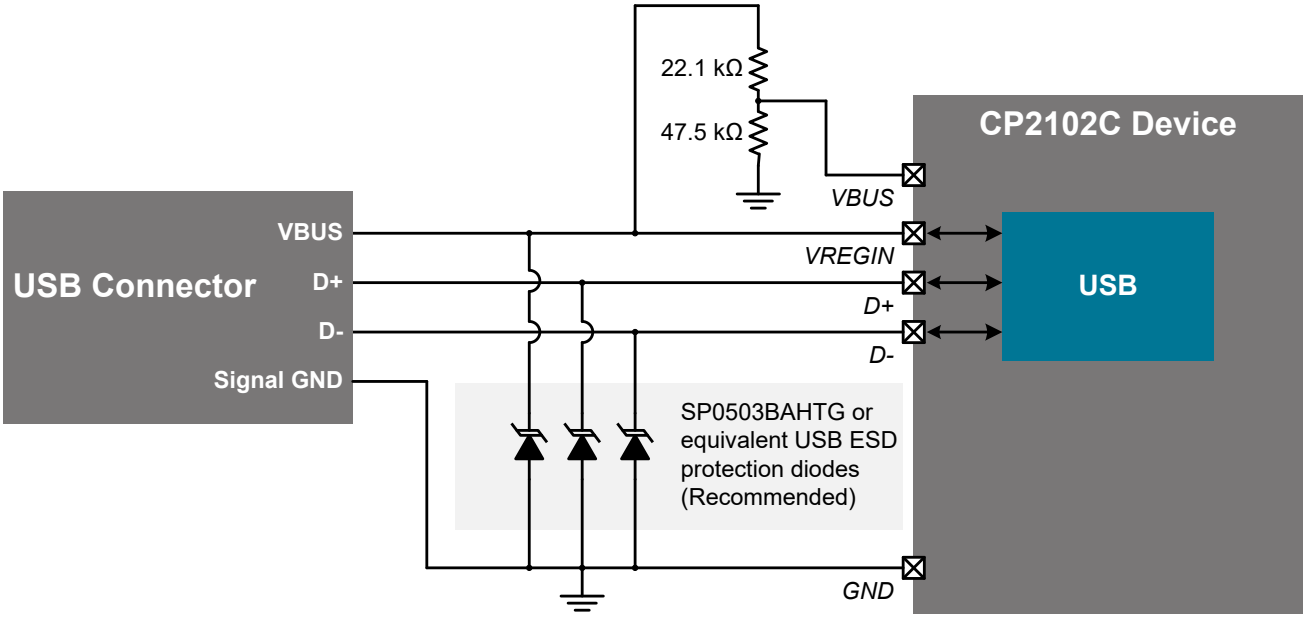


Figure 1.1. Bus-Powered Connection Diagram for USB Pins

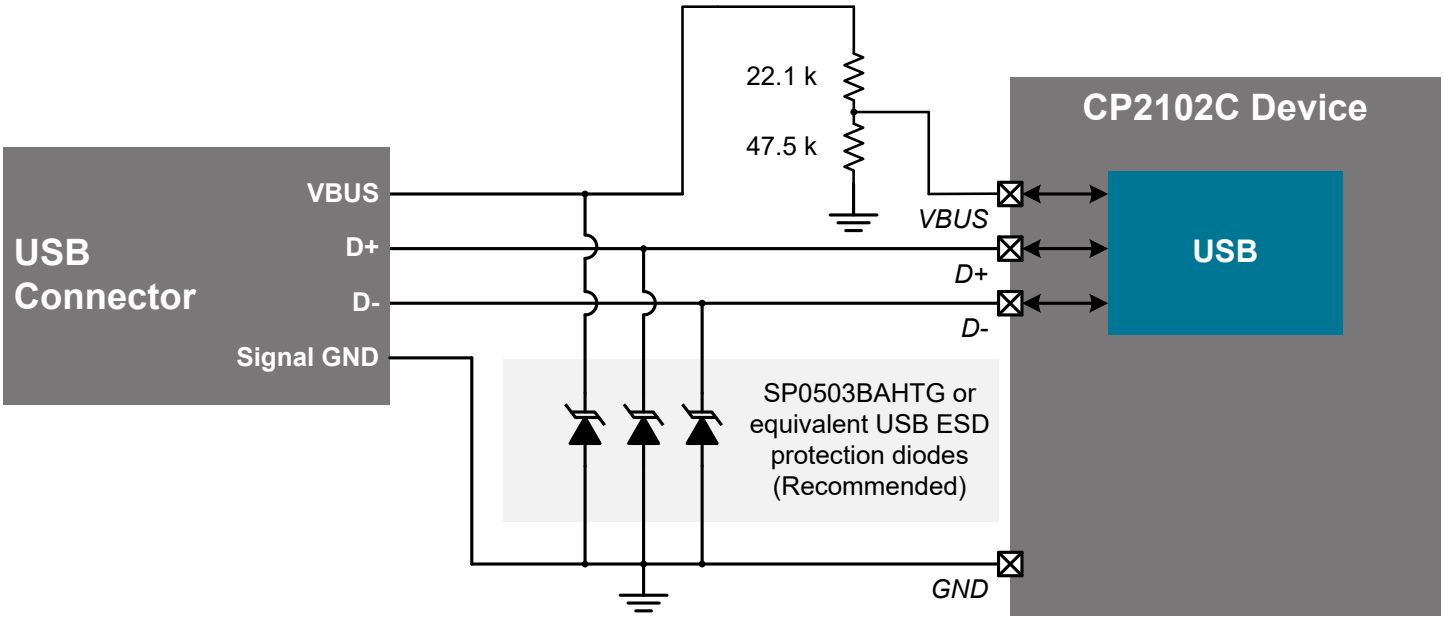


Figure 1.2. Self-Powered Connection Diagram for USB Pins

2. Device Migration

The following sections describe the migration considerations when transitioning from an existing CP210x device to a CP2102C device.

2.1 CP2101 to CP2102C

Hardware Compatibility

The CP2102C-A01-GQFN28 is pin-compatible with the CP2101 with the addition of the voltage divider circuit shown in Figure 1.1 Bus-Powered Connection Diagram for USB Pins on page 3 and Figure 1.2 Self-Powered Connection Diagram for USB Pins on page 4.

Software Compatibility

The CP2102C has a UART feature compatible with the CP2101. No software changes will be required when transitioning a CP2101 design to the CP2012C.

2.2 CP2102/9 to CP2102C

Hardware Compatibility

The CP2102C-A01-GQFN28 is pin compatible with the CP2102/9 with the addition of the voltage divider circuit shown in Figure 1.1 Bus-Powered Connection Diagram for USB Pins on page 3 and Figure 1.2 Self-Powered Connection Diagram for USB Pins on page 4.

The CP2109 has an additional hardware requirement that the VPP pin (pin 18) should be connected to a capacitor to ground for in-system programming. This capacitor is not required on the CP2102C and can be safely omitted.

Software Compatibility

The CP2102C is compatible with the CP2102/9 with one exception:

- Baud Rate Aliasing

Baud Rate Aliasing is a feature that allows a device to use a pre-defined baud rate in place of a baud rate that is requested by the user. For example, a device using Baud Rate Aliasing can be programmed to use a baud rate of 45 bps whenever 300 bps is requested. Baud Rate Aliasing is not supported on the CP2102C.

If Baud Rate Aliasing is used in a CP2102/9 design, the CP2102C is incompatible as a replacement.

2.3 CP2103 to CP2102C

Hardware Compatibility

The CP2102C does not have a pin-compatible variant that can replace the CP2103:

- The CP2103 QFN28 package has an additional VIO pin at pin 5 which shifts the function of the previous pins on the package clockwise around the package by one pin compared to the CP2102C QFN28 package. This affects pins 1-5 and 22-28.
- Unlike the CP2103, the CP2102C does not support extra functionality on pins 16-19.
- All other pins remain in the same configuration.

If a separate VIO rail is required for a design, the smaller CP2102C QFN24 variant can be used. This variant has an identical functionality set as the CP2103, but in the smaller QFN24 package.

Aside from this difference in pin-outs, no other hardware changes are required to migrate from the CP2103 to the CP2102C.

Software Compatibility

The CP2102C has a UART feature compatible with the CP2103 with one exception: Baud Rate Aliasing.

Baud Rate Aliasing is a feature that allows a device to use a pre-defined baud rate in place of a baud rate that is requested by the user. For example, a device using Baud Rate Aliasing can be programmed to use a baud rate of 45 bps whenever 300 bps is requested. Baud Rate Aliasing is not supported on the CP2102C.

If Baud Rate Aliasing is used in a CP2103 design, the CP2102C is incompatible as a replacement.

2.4 CP2104 to CP2102C

Hardware Compatibility

The CP2102C-A01-GQFN24 is pin compatible with the CP2104 with the addition of the voltage divider circuit shown in Figure 1.1 Bus-Powered Connection Diagram for USB Pins on page 3 and Figure 1.2 Self-Powered Connection Diagram for USB Pins on page 4. No other hardware changes are required when transitioning a CP2104 design to the CP2102C. The CP2104 does require a capacitor between VPP (pin 16) and ground for in-system programming, but this pin is not connected on the CP2102C. Whether or not this capacitor is attached to this pin will have no effect on the CP2102C.

Software Compatibility

The CP2102C has a UART feature compatible with the CP2104. No software changes will be required when transitioning a CP2104 design to the CP2012C.

2.5 CP2102N to CP2102C

Hardware Compatibility

The CP2102C-A01-GQFN24 / CP2102C-A01-GQFN28 are pin compatible with the CP2102N-A02-GQFN24 / CP2102N-A02-GQFN28 with the addition of the voltage divider circuit shown in Figure 1.1 Bus-Powered Connection Diagram for USB Pins on page 3 and Figure 1.2 Self-Powered Connection Diagram for USB Pins on page 4. No other hardware changes are required when transitioning a CP2102N design to the CP2102C.

Software Compatibility

The CP2102C has a UART feature compatible with the CP2102N. No software changes will be required when transitioning a CP2102N design to the CP2012C.

3. Revision History

Revision 1.0

March 2025

- Initial version.

Simplicity Studio

One-click access to MCU and wireless tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!

IoT Portfolio
www.silabs.com/IoT

SW/HW
www.silabs.com/simplicity

Quality
www.silabs.com/quality

Support & Community
www.silabs.com/community

SILICON LABS

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
USA

www.silabs.com