

AN976: CP2101/2/3/4/9 to CP2102N Porting Guide

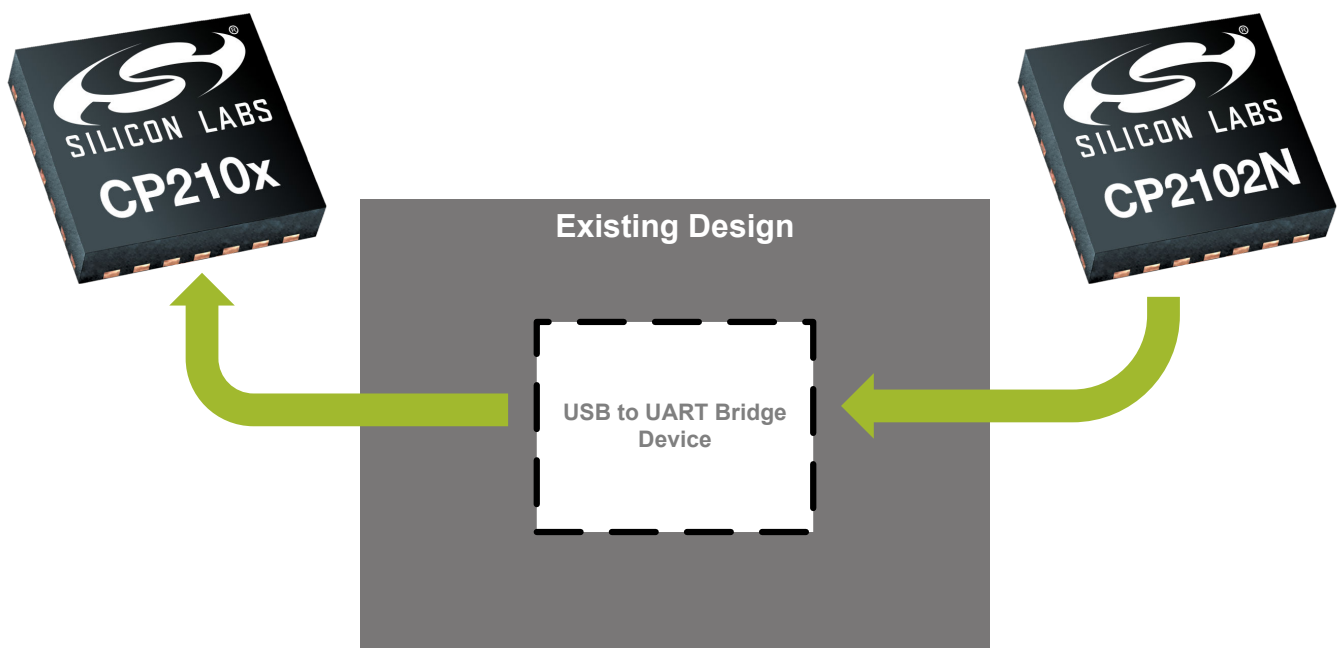
The CP2102N USB-to-UART bridge device has been designed to be a drop-in replacement and upgrade for existing single-interface CP210x USB-to-UART devices.

For some devices, such as the CP2102 and CP2104, the CP2102N is a direct upgrade, being both pin and feature compatible. This means that no hardware or software changes are required to use the CP2102N in existing designs. For other devices, slight package or feature differences may require minor changes to hardware or host software.

This application note describes in detail the steps required to integrate a CP2102N device into a design in place of a previous CP210x device. Devices covered by this application note are: CP2101, CP2102/9, CP2103, and CP2104. Multiple-interface devices, such as the CP2105 and CP2108, are not discussed.

KEY POINTS

- The CP2102N is pin and feature compatible with most existing CP210x devices.
- Some designs will require minor hardware or software changes when migrating to the CP2102N.
- The CP2102N is generally a direct upgrade from existing CP210x devices.
- The CP2102N provides a migration path for:
 - CP2101
 - CP2102/9
 - CP2103
 - CP2104



1. Device Comparison

1.1 Feature Compatibility

A full feature comparison table for all CP210x devices, including the CP2102N, is given below. In general, the CP2102N meets or exceeds the feature set of all previous CP210x devices.

Table 1.1. CP210x Family Features

| Feature | CP2101 | CP2102 | CP2109 | CP2103 | CP2104 | CP2102N |
|-----------------------------|-----------|-----------|-----------|-----------|-----------|---------------|
| 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 |
| Data Bits: 8 | X | X | X | X | X | X |
| Data Bits: 5, 6, 7 | | X | X | X | X | X |
| Stop Bits: 1 | X | X | X | X | X | X |
| Stop Bits: 1.5, 2 | | X | X | X | X | X |
| Parity Bit: Odd, Even, None | X | X | X | X | X | X |
| Parity Bit: Mark, Space | | X | X | X | X | X |
| Hardware handshake | X | X | X | X | X | X |
| X-ON/X-OFF handshake | X | X | X | X | X | X |
| Event Character Support | X | X | X | | | X |
| Line Break Transmission | | X | X | | | X* (see note) |
| 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 |
| RS-485 support | | | | X | X | X |
| GPIOs | None | None | None | 4 | 4 | 4-7 |
| Battery Charger Detect | | | | | | X |
| Remote Wake-up | | | | | | X |
| Clock Output | | | | | | X |

Note: The CP2102N cannot directly generate Line Break Conditions. The use of this feature is generally considered uncommon, although it was previously supported on CP2102/9 devices. A Line Break Condition occurs when the receiver input is held to logic low (i.e. zero) for some period of time, generally for more than one character time. This condition is seen by the receiver as a character with all zero bits with a framing error. A user can potentially emulate this on a CP2102N, however, by changing the baud rate to be slower than expected, then transmitting a null character. The CP2102N does have the capability to receive Line Breaks.

1.2 Pin Compatibility

The CP2102N is pin-compatible with most CP210x devices. Below is a table of pin-compatible variants of the CP2102N that can be used to replace previous CP210x devices.

Table 1.2. CP2102N pin-compatible replacements for CP210x devices

| CP210x Device | Pin-compatible replacement |
|---------------|--|
| CP2101 | CP2102N-A01-GQFN28 |
| CP2102/9 | CP2102N-A01-GQFN28 |
| CP2103 | None (refer to 2.3 CP2103 to CP2102N for migration considerations) |
| CP2104 | CP2102N-A01-GQFN24 |

2. Device Migration

The following sections describe the migration considerations when transitioning from an existing CP210x device to a CP2102N device.

2.1 CP2101 to CP2102N

Hardware Compatibility

The CP2102N-A01-GQFN28 is fully pin compatible with the CP2101. No hardware changes will be required when transitioning a CP2101 design to the CP2102N.

The CP2102N does, however, have extra functionality on pins 13 through 22. A new design may want to take advantage of these extra pins, but they can be safely left unconnected.

Software Compatibility

The CP2102N is fully feature compatible with the CP2101. No software changes will be required when transitioning a CP2101 design to the CP2102N.

The CP2102N does have several common features that the CP2101 lacks. For example, the CP2101 only allows for 8 data bits per frame, where the CP2102N has the ability for 5, 6, 7, or 8 data bits. If desired, the CP2102N can be customized to disable these additional features.

2.2 CP2102/9 to CP2102N

Hardware Compatibility

The CP2102N-A01-GQFN28 is fully pin compatible with the CP2102/9. No hardware changes will be required when transitioning a CP2102/9 design to the CP2102N.

The CP2102N does, however, have extra functionality on pins 13 through 22. A new design may want to take advantage of these extra pins, but they can be safely left unconnected.

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 CP2102N and can be safely omitted.

Software Compatibility

The CP2102N is feature compatible with the CP2102/9, with two exceptions:

- Baud Rate Aliasing
- Line Breaks / Break Conditions

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 CP2102N.

If Baud Rate Aliasing is used in a CP2102/9 design, the CP2102N is incompatible as a replacement.

Line Breaks (also called a Break Condition) occur when the transmission line to logic low for more than one character time. The CP2102/9 devices have the ability to transmit a Line Break or Break Condition by directly setting the device's break state property. This forces the transmission line to logic low until the break state property is cleared. This feature is not directly supported on the CP2102N. However, a break condition can be emulated by temporarily lowering the baud rate, then transmitting a null character. The duration of this emulated break condition can be controlled by adjusting the baud rate, but it cannot exceed 27ms (8 bits at the lowest available baud rate, 300bps).

If Break Conditions are used in a CP2102/9 design, care must be taken to assure that the CP2102N can emulate these conditions correctly.

2.3 CP2103 to CP2102N

Hardware Compatibility

The CP2102N does not have a pin-compatible variant to replace the CP2103. The QFN-28 package of the CP2103 has an additional VIO pin at pin 5 which shifts the function of previous pins on the package clock-wise around the package by one pin compared to the CP2102N QFN-28 package. This affects pins 1-4 and 22-28. All other pins remain in the same configuration.

If a separate VIO rail is required for a design, the smaller CP2102N QFN-24 variant can be used. This variant has an identical functionality set as the CP2103, but in the smaller QFN-24 package.

Beside this difference in pin-outs, no other hardware changes are required to migrate from the CP2103 to the CP2102N.

Software Compatibility

The CP2102N is fully 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 CP2102N.

If Baud Rate Aliasing is used in a CP2103 design, the CP2102N is incompatible as a replacement.

2.4 CP2104 to CP2102N

Hardware Compatibility

The CP2102N-A01-GQFN24 is fully pin compatible with the CP2104. No hardware changes will be required when transitioning a CP2104 design to the CP2102N. The CP2104 does require a capacitor between VPP (pin 16) and ground for in-system programming, but this pin is not connected on the CP2102N. Whether or not this capacitor is attached to this pin will have no effect on the CP2102N.

Software Compatibility

The CP2102N is fully feature compatible with the CP2104. No software changes will be required when transitioning a CP2104 design to the CP2102N.

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