

UG369: Wireless Xpress BGX13P SLEXP8027A Kit User's Guide



The Wireless Xpress BGX13P expansion board is an excellent starting point to get familiar with the Bluetooth Xpress BGX13 Bluetooth Low Energy module.

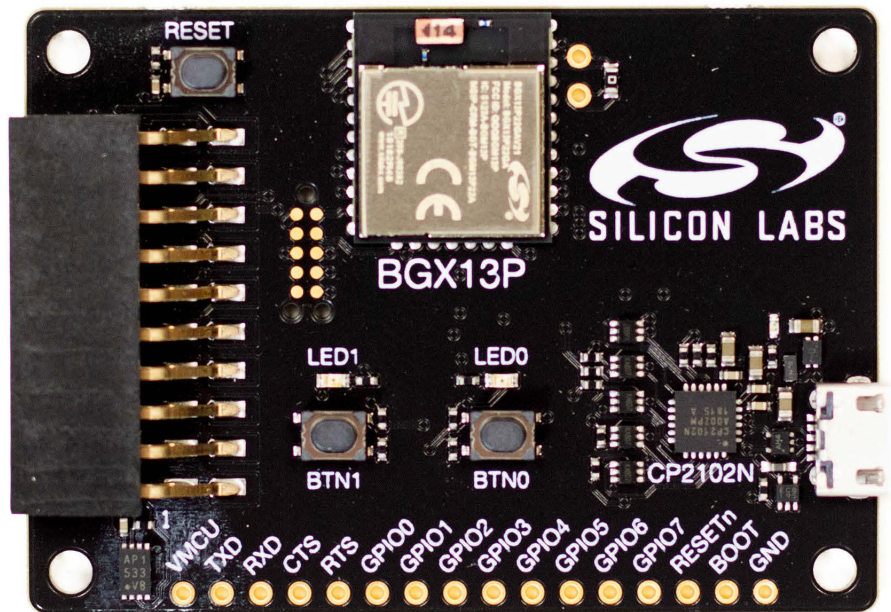
The evaluation board includes everything a developer needs to exercise the BGX13P's serial interface and demonstrate data transfer over Bluetooth Low Energy. The board can operate in a stand-alone mode by connecting a PC to the on-board CP2102N USB-to-UART bridge device. The board can also operate in a simulated embedded host mode with a Silicon Labs EFM8 or EFM32 starter kit, which can be attached to the expansion board's header.

The kit includes the following:

- BGX13P Expansion Board
- Getting Started card
- 1 x micro USB cable

KEY FEATURES

- BGX13P is a Bluetooth Low Energy cable replacement device
- Can connect to another BGX13 device or to a smart phone
- UART interface and flow control pins use Xpress command API to connect and communicate across the Bluetooth LE link
- Breakout test points for easy interface with prototype boards
- Power sources include USB and EXP Header



1. Getting Started

Software

To set up the software for the BGX13P kit:

1. Install the CP210x Virtual COM Port (VCP) driver, available at: <https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>
2. Install the BGX Commander mobile app, available in the Android and iOS app stores.
3. Install Simplicity Studio, available at: <https://www.silabs.com/products/development-tools/software/simplicity-studio>.

Hardware

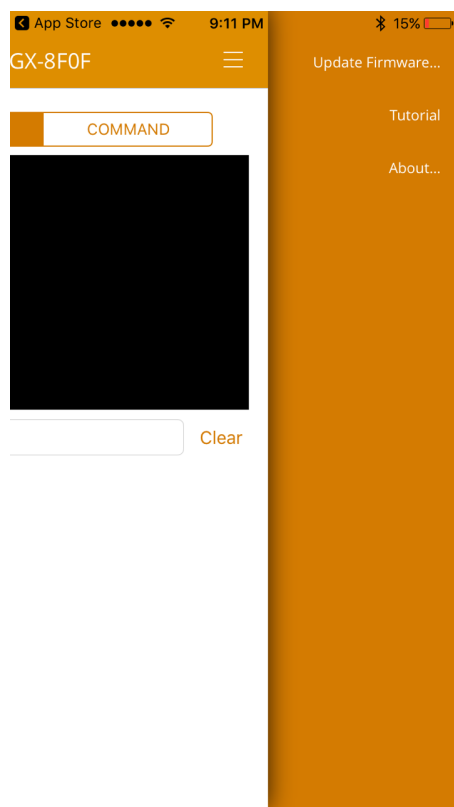
To set up the hardware for the BGX13P kit:

1. Connect the micro USB cable to BGX13P board and the other end to the PC.
2. Ensure the green LED near the USB connector is on.
3. Ensure to CP2102N USB-to-UART bridge enumerates successfully.
 - In Windows, the device manager should show "Silicon Labs CP210x USB to UART bridge (COMx)", where x is the COM port number.

Update Firmware

The BGX Commander application can upgrade the device's firmware over bluetooth. Update the firmware now to ensure that the Bluetooth Xpress module is running the latest version.

1. While still connected to the Bluetooth Xpress module, tap the menu icon located at the top-right corner of the application.
2. Tap [**Update Firmware**] to begin the upgrade.



2. Kit Block Diagram

An overview of the BGX13P expansion board is shown in the figure below.

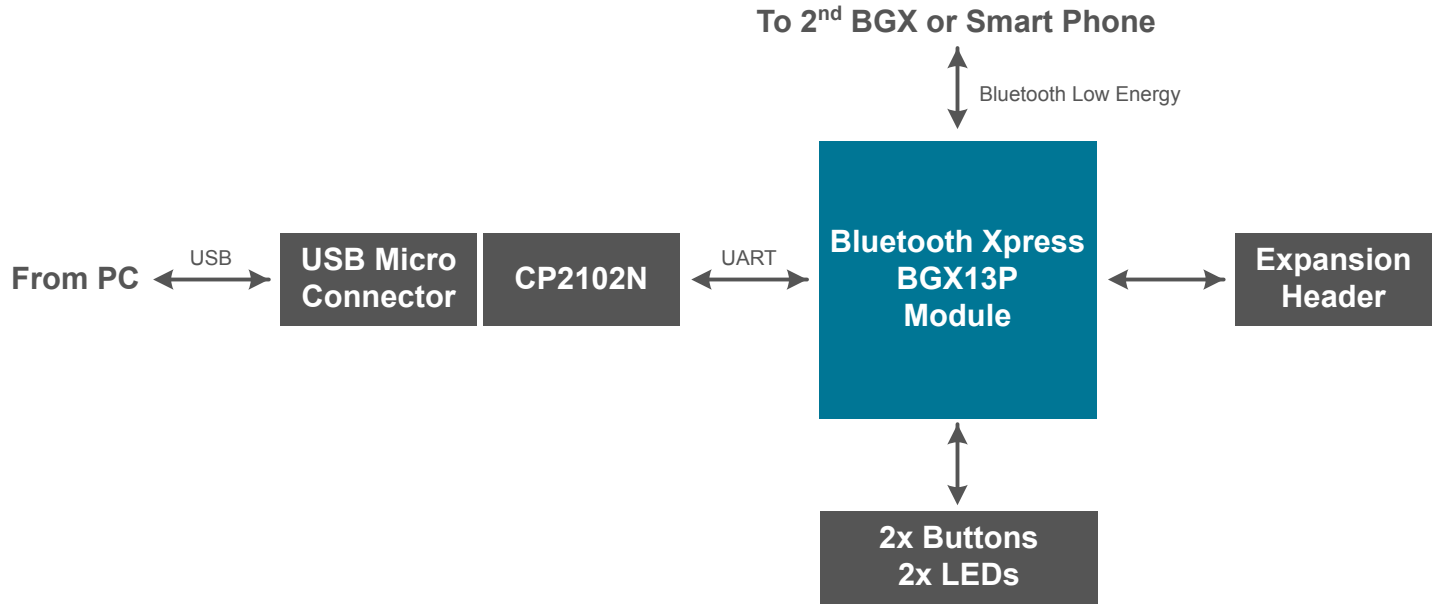


Figure 2.1. BGX13P Expansion Board Block Diagram

3. Kit Hardware Layout

The layout of the BGX13P expansion board is shown below.

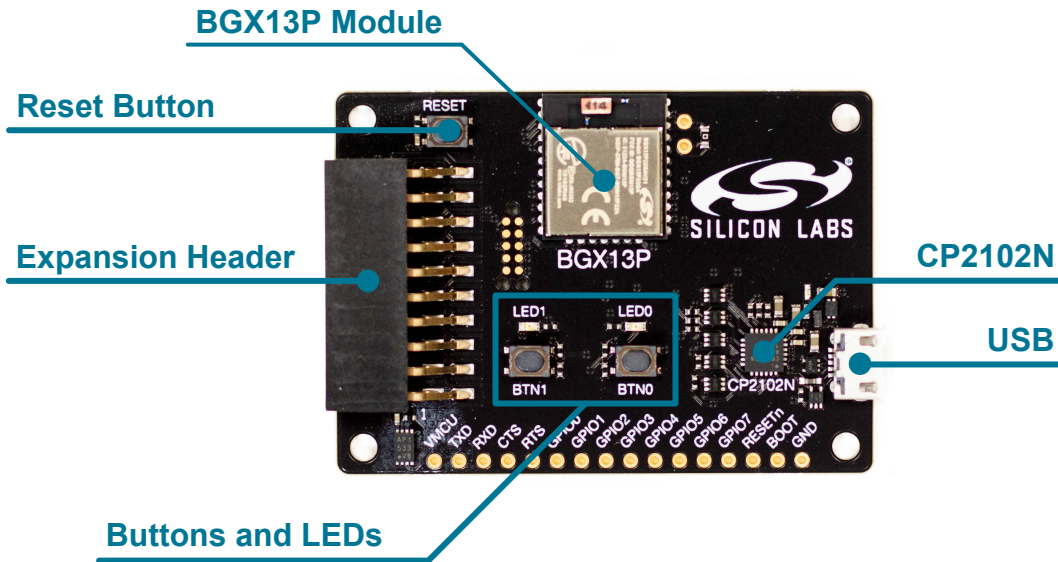


Figure 3.1. BGX13P Expansion Board Hardware Layout

4. Power and Operation

4.1 Power Selection

The BGX13P expansion board is designed to be powered by two different sources:

- CP2102N internal regulator
- Expansion header

The figure shows how the different power sources are connected to the BGX13P.

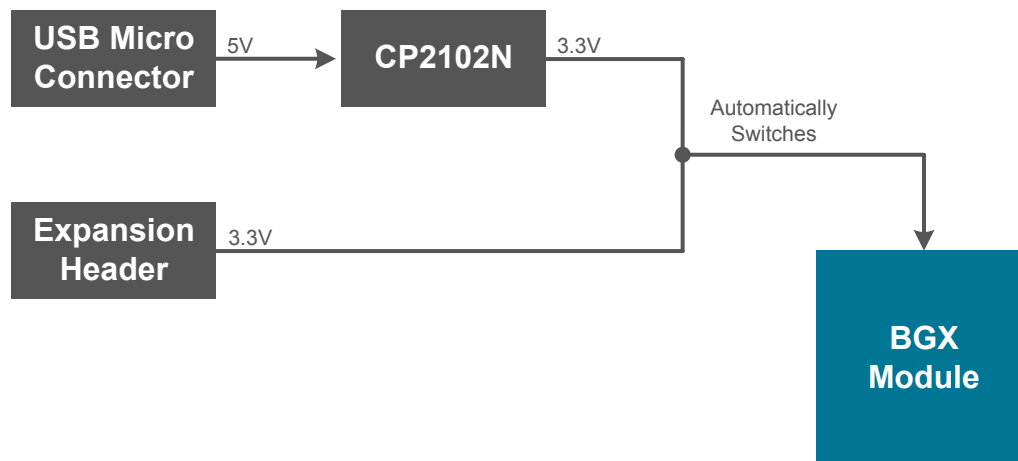


Figure 4.1. BGX13P Power Supply

When the USB is connected, the BGX13P is powered from the CP2102N internal regulator, which is in turn powered by the USB cable.

The board can also be powered externally through the VMCU and GND pins of the expansion header when the board is attached to a power supply or an EFM MCU Starter Kit.

When power is provided through the USB or an external power supply, the BGX13P module can act as a stand alone device. When it is connected to an EFM MCU Starter Kit through the expansion header, the BGX13P acts as a peripheral to the MCU.

4.2 Standalone

In standalone mode, the BGX13P on the evaluation board can be communicated with using the CP2102N UART-to-USB bridge device. Simply connect to the CP2102N's virtual COM port in a terminal program and interface with the BGX.

Note: By default, the Bluetooth Xpress module communicates at 115200 baud, though this is a configurable setting.

In standalone mode, the device can function as either a *central* and connect with a second Bluetooth Xpress module, or as a *peripheral*, which can be discovered and connected to by a second Bluetooth Xpress module or the BGX commander app.

Test points on the board enables developers to fly wires into their own prototype designs, adding Bluetooth LE with just a UART interface and power/ground.

4.3 Connected to the Expansion Header

The BGX13P expansion board is designed to quickly attach to any EFM32 and EFM8 MCU starter kit and jumpstart the development of BLE-connected applications. Attach the evaluation board to the STK through the expansion header to connect power and communication pins.

To see how the board works in conjunction with the MCU starter kit, go to the starter kit's Demos under Getting Started in Simplicity Studio and run [BGX13P demo]. Starter kits currently offering BGX demo firmware are EFM8SB2 and EFM8UB1.

5. Peripherals

The starter kit has a set of peripherals that showcase some of the features of the BGX13 module.

Be aware that some I/O routed to peripherals are also routed to the breakout pads. This must be taken into consideration when using the breakout pads for your application.

5.1 Push Buttons and LEDs

The board includes 2 active-low LEDs and 2 mechanical buttons to exercise I/O capabilities of the BGX13P. The connects are shown in the following table.

Table 5.1. LEDs and Buttons Connected to BGX13P

BGX13P Pin	LED/Button
GPIO0	LED0
GPIO1	LED1
GPIO2	BTN0
GPIO3	BTN1

To use a LED, the GPIO connected to the LED needs to be configured to use the LED. For instance, the Bluetooth Xpress module could indicate Bluetooth connection status by configuring the GPIO0 pin as the `con_status_led`. GPIOs can be configured using either Xpress Configurator's GUI-based GPIO configuration window or manually, using the Xpress Configurator's terminal window or using the terminal program of your choice. For example, to manually configure GPIO0 as the `con_status_led`, connect to the board's virtual COM port and send the following command in the terminal window:

```
gfu 0 con_status_led
```

To test, connect to the BGX13P over BLE using the BGX Commander mobile app. When the app connects to the expansion board, note that LED0 turns on, indicating an established connection.

To use a mechanical button, the GPIO connected to the button needs to be configured to standard input mode. Again, GPIOs can be configured using either Xpress Configurator's GUI-based GPIO configuration window or manually, using the Xpress Configurator's terminal window or using the terminal program of your choice. For example, to configure GPIO2 as standard input mode, connect to the board's virtual COM port and send the following command in the terminal window:

```
gfu 2 stdio
```

```
gdi 2 in
```

To test, connect to the BGX13P over BLE using the BGX Commander mobile app. In the screen that appears, choose 'Command' mode. Issue the following command to the BGX13P:

```
gge 2
```

The BGX will respond with '1'. Press down the button and issue the command `gge 2` again. The response will now be '0'.

Note: In addition to controlling port pins, special functions exist in the BGX13P to enable control of power, connection state, and other features through pin inputs. For a full description of available pin functions, please see docs.silabs.com.

6. Connectors

6.1 Test Points

The test points located on bottom edge of the board. Test points are available for the Bluetooth Xpress module's power/ground pins, UART pins, all GPIOs, reset pin, and boot pin.

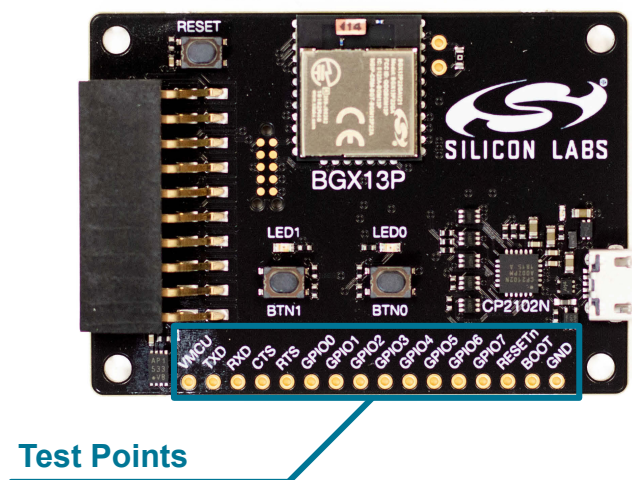


Figure 6.1. Test Points

6.2 Expansion Header

On the left hand side of the board is a female expansion header to connect to a Silicon Labs EFM8 or EFM32 Starter Kit (STK). The connector contains a number of output and communication pins that can be used to communicate with the MCU on the STK. Additionally, the VMCU, 3V3, and 5V power rails are also available. The figure below shows the pin assignment of the expansion header.

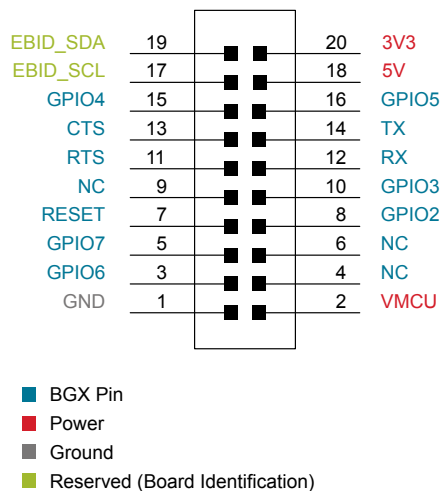


Figure 6.2. Expansion Header

7. Simplicity Studio

Simplicity Studio contains tools to configure and evaluate the BGX13P.

7.1 Xpress Configurator

Xpress Configurator is a GUI tool used to configure parameters of the BGX13P, save those values, and export settings in a number of useful ways.

Note: All configuration of the BGX executes across the serial interface, and any step taken by Xpress Configurator can be reproduced by an embedded host connected to the BGX13P's UART interface.

All communication between the BGX13P expansion board and the Xpress Configurator can be seen in the terminal window embedded in the Xpress Configurator tool.

For more information on Xpress Configurator, please see docs.silabs.com.

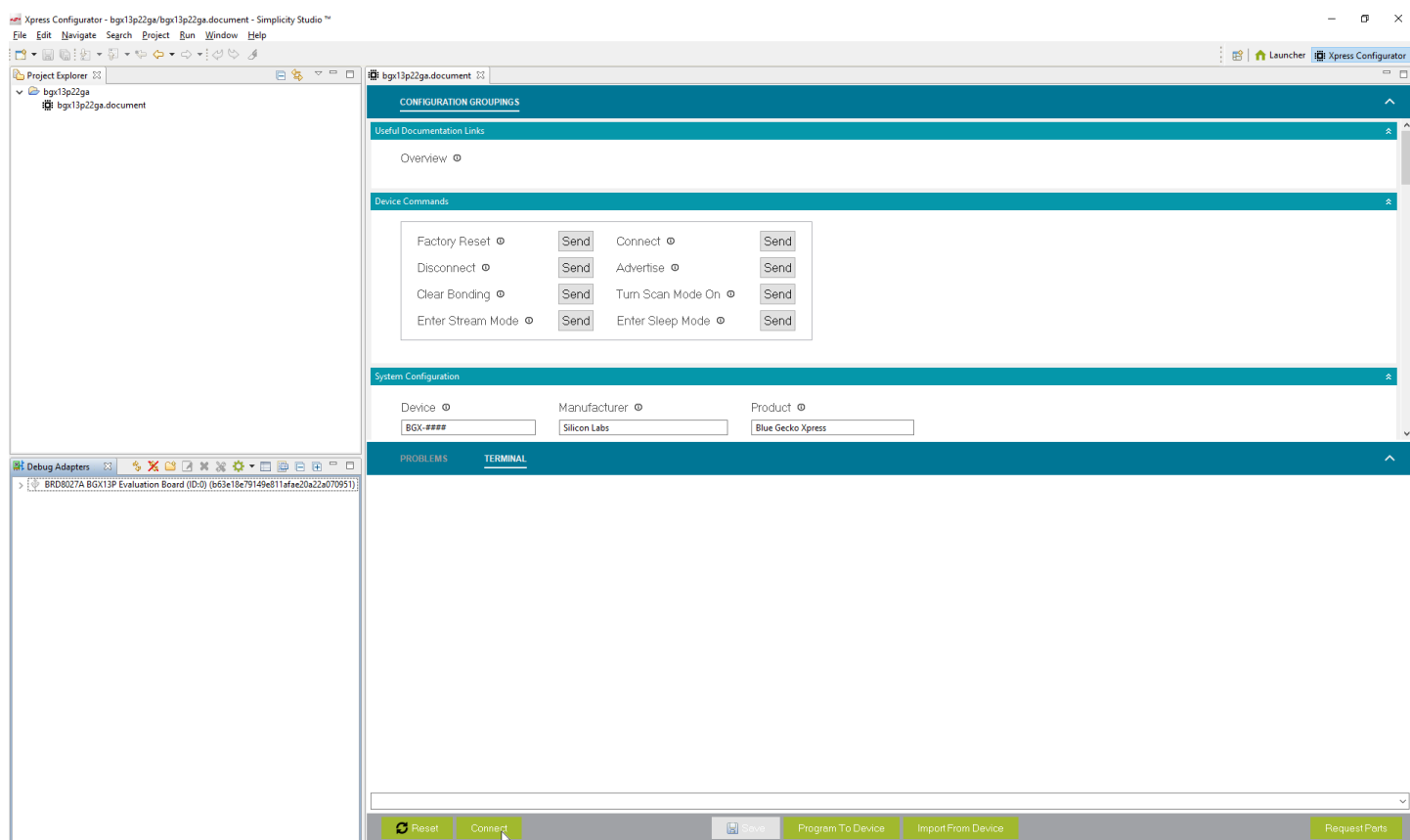


Figure 7.1. Simplicity Studio Xpress Configurator

7.2 Advanced Energy Monitor

When the BGX13P expansion board is connected to a Silicon Labs STK, the STK's Advanced Energy Monitor (AEM) hardware also measures the BGX13P's power consumption using the VMCU connection on the EXP header. By using the [Energy Profiler] in Simplicity Studio, current consumption and voltage can be measured in real time.

More details about AEM and its operation can be found in the STK User Guide. Note that AEM will measure the current for all circuitry connected to VMCU, including the STK MCU and the CPT device.

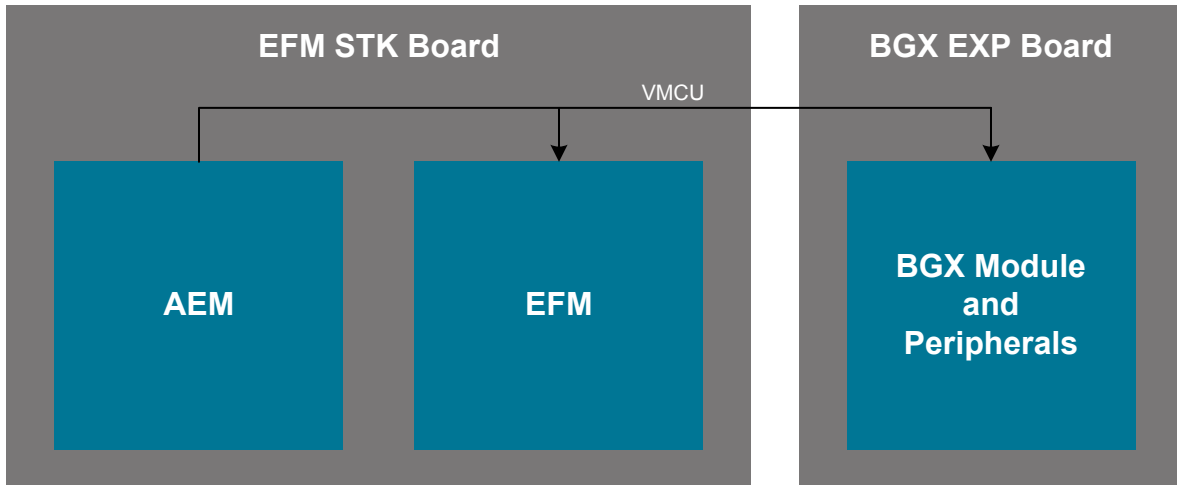


Figure 7.2. Measuring BGX13P Expansion Board Current Using AEM

8. Schematics, Assembly Drawings, and BOM

8.1 Board Files

The schematics, assembly drawings and bill of materials (BOM) for the BGX13P expansion board are available through Simplicity Studio when the kit documentation package has been installed. To access these documents, click the **[Kit Documentation]** tile after selecting the device in the left pane.

8.2 Board Revision History

- A02 — Updated CP2102N to revision A02.
- A01 — Corrected labels for the EXP header on the PCB backside.
- A00 — Initial production revision.

A02 Revision Boards

These boards do not currently have any known issues.

A01 Revision Boards

These boards do not currently have any known issues.

A00 Revision Boards

EXP header labels on the back incorrectly show LED0 and LED1 on pin 4 & 6.

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