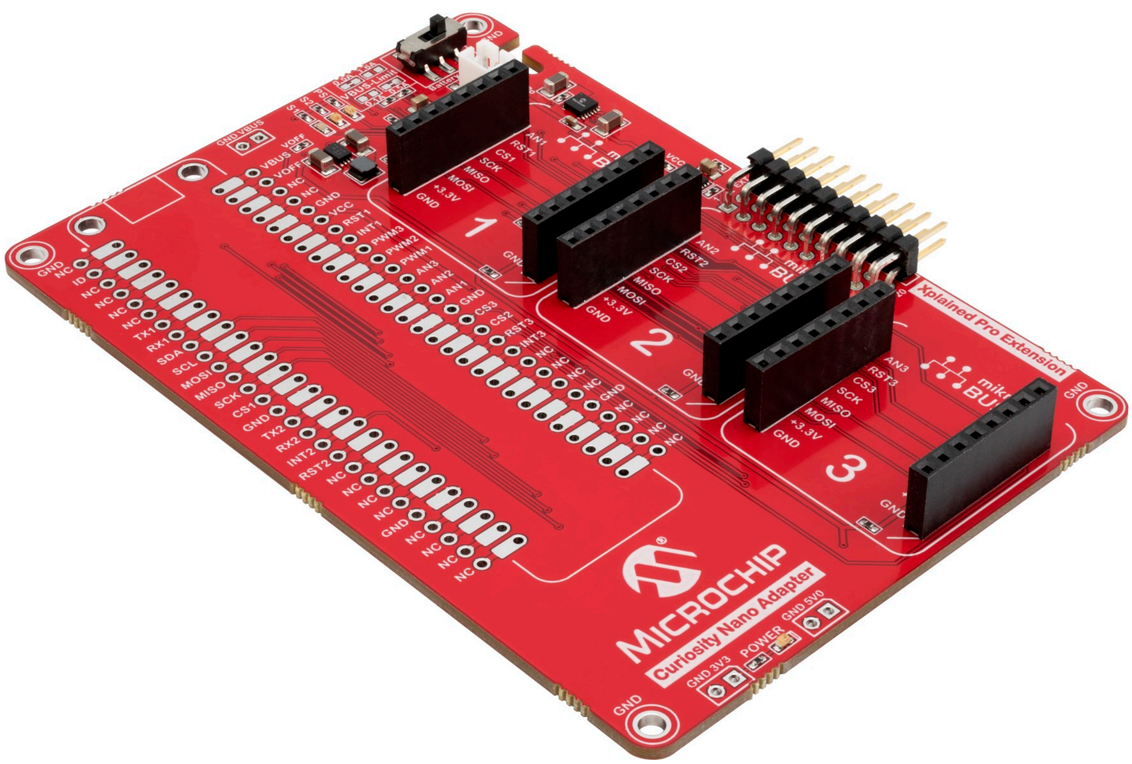
Curiosity Nano Adapter

Curiosity Nano Adapter Hardware User Guide

Preface

The Curiosity Nano Adapter evaluation kit is a hardware extension platform to ease the connection between Curiosity Nano kits and extension boards like the mikroBUS™ Click modules and Xplained Pro extension boards.

The Curiosity Nano Adapter has an on-board Li-Ion/LiPo charger and management circuit for battery powered operation of the board.



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- Three mikroBUS Sockets
- One Xplained Pro Extension Header
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  - Alternative external power input
  - Option to power from, and charge, 4.20V Li-Ion/LiPo batteries
  - Fixed 3.3V PSU for target and mikroBUS sockets
  - Fixed 5.0V Boost converter for 5V mikroBUS sockets

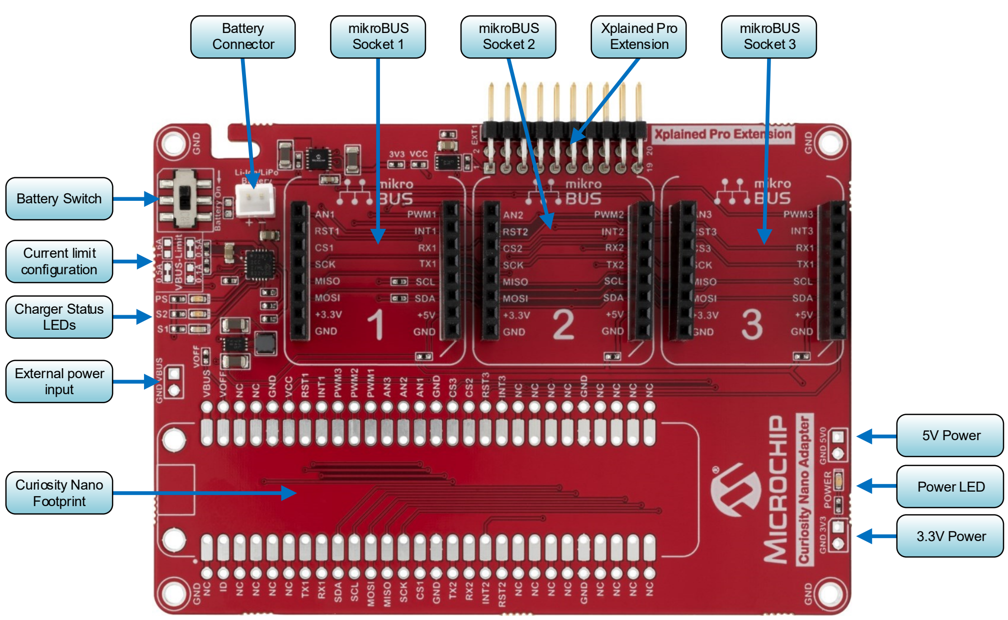
1.2 Kit Overview

Curiosity Nano Adapter allows easy connection of Mikro Elektronika mikroBUS™ Click boards and Xplained Pro extensions to Curiosity Nano evaluation kits.

The kit is powered through USB on a mounted Curiosity Nano kit by default, and the Curiosity Nano Adapter can also be powered from a Li-Ion/LiPo battery or an external source.

Curiosity Nano Adapter is shipped with pin-headers and pin-sockets to connect Curiosity Nano evaluation kits.

Figure 1-1. Curiosity Nano Adapter Evaluation Kit Overview



2. Getting Started

2.1 Curiosity Nano Quick Start

Steps to start exploring the Curiosity Nano platform:

1. Download Atmel Studio/Microchip MPLAB® X IDE.
2. Launch Atmel START or MPLAB® Code Configurator.
3. Find the code examples for the Curiosity Nano kit attached to the Curiosity Nano Adapter.

Use the code examples as a base for your own firmware development.

2.2 Design Documentation and Relevant Links

The following list contains links to the most relevant documents and software for the Curiosity Nano Adapter.

- **MPLAB® X IDE** - MPLAB® X IDE is a software program that runs on a PC (Windows®, Mac OS®, Linux®) to develop applications for Microchip microcontrollers and digital signal controllers. It is called an Integrated Development Environment (IDE) because it provides a single integrated "environment" to develop code for embedded microcontrollers.
- **Atmel Studio** - Free IDE for the development of C/C++ and assembler code for microcontrollers.
- **IAR Embedded Workbench® for AVR®** - This is a commercial C/C++ compiler that is available for 8-bit AVR. There is a 30-day evaluation version as well as a 4 KB code-size-limited kick-start version available from their website.
- **Atmel START** - Atmel START is an online tool that helps the user to select and configure software components and tailor your embedded application in a usable and optimized manner.
- **Microchip Sample Store** - Microchip sample store where you can order samples of devices.
- **Data Visualizer** - Data Visualizer is a program used for processing and visualizing data. The Data Visualizer can receive data from various sources such as the EDBG Data Gateway Interface found on Curiosity Nano and Xplained Pro boards and COM Ports.
- Xplained Pro Extension Kits - Xplained Pro Extensions for peripheral functions.
- **Curiosity Nano Adapter website** - Kit information, latest user guide and design documentation.
- **Curiosity Nano Adapter on Microchip Purchasing & Client Services** - Purchase this kit on Microchip Purchasing & Client Services.

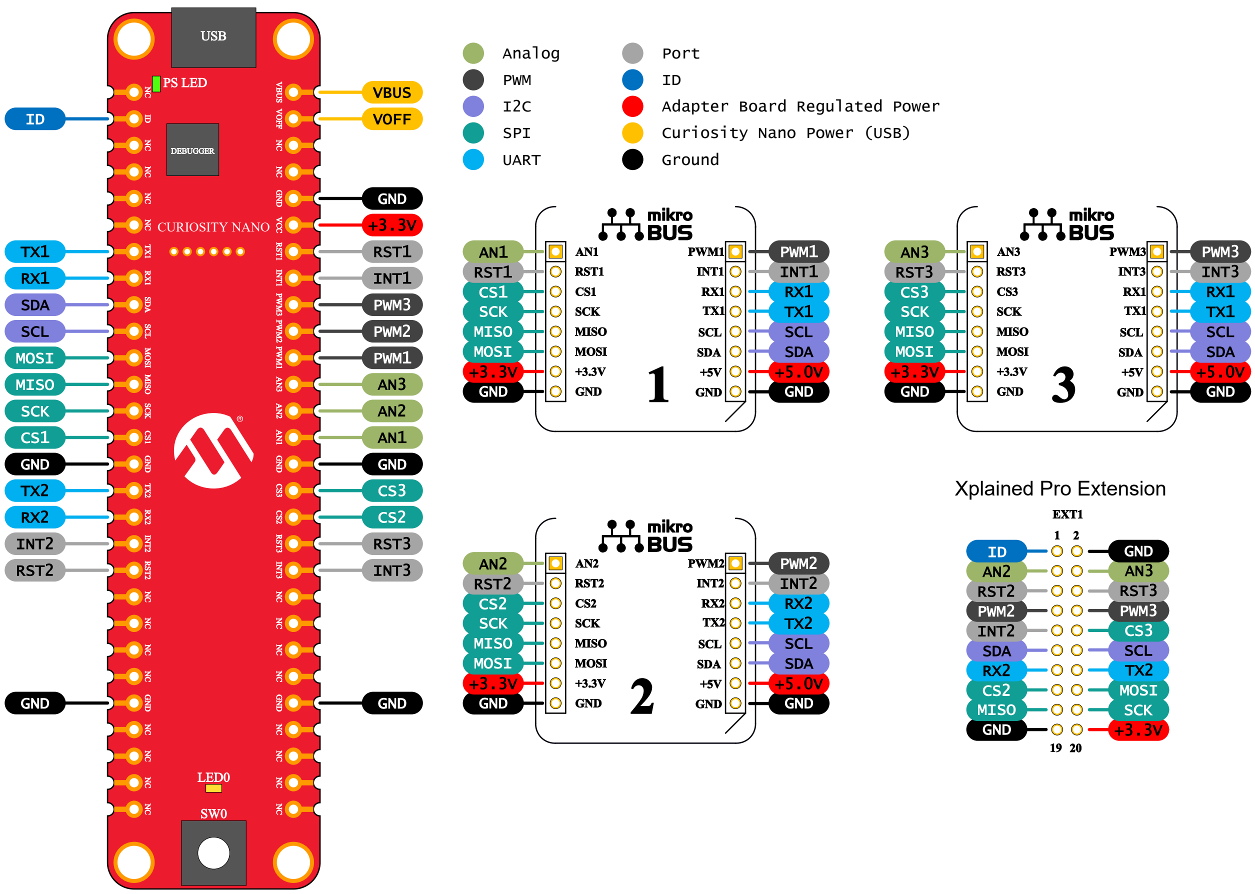
3. Hardware User Guide

3.1 Curiosity Nano Adapter Pinout

The figure below shows how a Curiosity Nano microcontroller board connects to each of the mikroBUS sockets and Xplained Pro extension.

Check the appendix of the user guide for your microcontroller board to easily figure out how the microcontroller I/Os are routed on the Curiosity Nano Adapter.

Figure 3-1. Curiosity Nano Adapter Pin-out

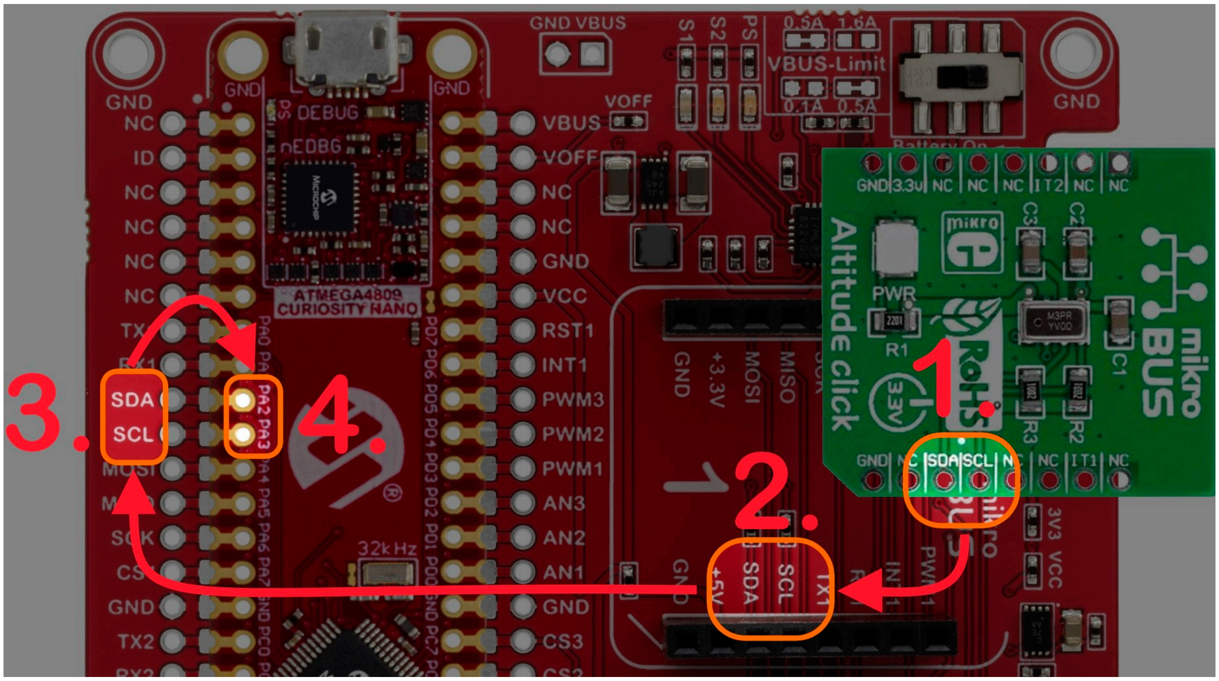


Info:
SPI and I^{2}C are shared between all connected hardware. The SPI bus has three unique chip select signals routed to each mikroBUS socket.

UART1 (TX1 and RX1) is shared between mikroBUS socket 1 and 3, while UART2 (TX2 and RX2) is shared between mikroBUS socket 2 and the Xplained Pro extension header.

The Xplained Pro extension header is shared with mikroBUS socket 2 and 3. Make sure to check for any conflicting signals if several add-on boards are in use at the same time.

Figure 3-2. Pin Map Example



The figure above shows how to identify which microcontroller pins on a ATmega4809 Curiosity Nano are connected to mikroBUS socket 1.

1. Identify which pins you want on the click module
2. Find the pin name inside the mikroBUS socket on the Curiosity Nano Adapter
3. Locate the same pin names next to the Curiosity Nano footprint
4. Read the pin names on the ATmega4809 Curiosity Nano board

SDA is connected to pin PA2 and SCL is connected to pin PA3 of the ATmega4809.

3.1.1 Xplained Pro Extensions

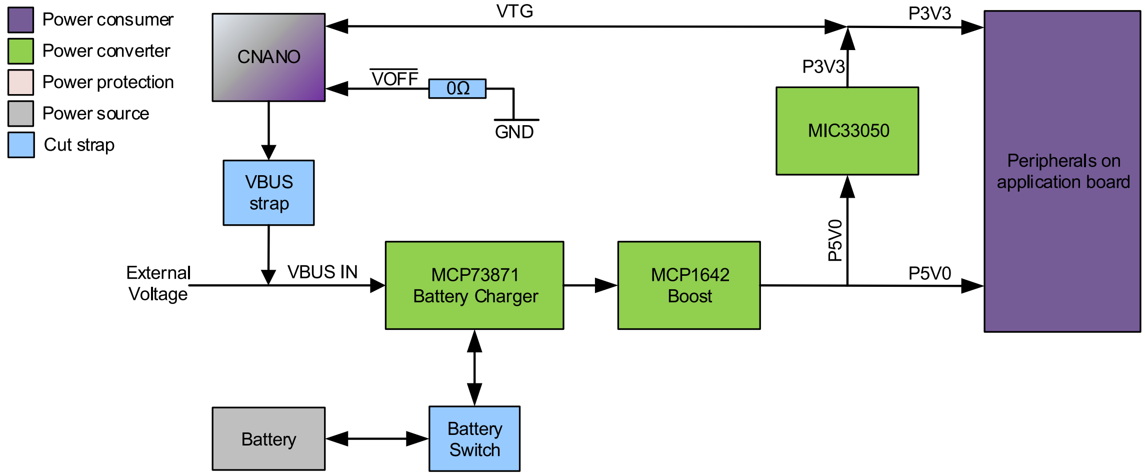
Xplained Pro Extensions are small extension boards with extra peripheral functions like the mikroBUS Click modules. The extension boards, originally intended for the Xplained Pro series of evaluation kits, are mostly not device specific and can be used with any microcontroller.

Note: The QTx Xplained Pro Extension kits are not ensured compatibility due to the device specific requirement of the Peripheral Touch Controller (PTC) and pinout.

3.2 Curiosity Nano Adapter Power Supply

The Curiosity Nano Adapter is powered from the USB port on a connected Curiosity Nano microcontroller board. The USB voltage is used to supply the MCP73871 battery charger, to generate 3.3V and 5.0V for the mikroBUS sockets, and to supply the Xplained Pro extension header and the microcontroller on the Curiosity Nano microcontroller board. The power LED at the bottom edge of the board is lit whenever there is a voltage on the 3.3V net.

Figure 3-3. Curiosity Nano Adapter Power Supply



Info: The $\overline{\text{VOFF}}$ pin connected to the Curiosity Nano microcontroller board is pulled low by the Curiosity Nano Adapter board. When $\overline{\text{VOFF}}$ is low, the power supply on the Curiosity Nano microcontroller board is disabled and 3.3V is supplied from the Curiosity Nano Adapter board to the microcontroller.

There are several ways to modify how the different parts of the board are powered. 5.0V can be removed from any of the mikroBUS sockets by removing *R16*, *R17*, and *R18*.

To power the board from an external power supply, cut *J11* and supply an external voltage from 4.5V to 6V through *J16*.

To use the variable voltage power supply on a Curiosity Nano microcontroller board remove *R11* and *R15*. The adapter board will no longer be powered through the MCP73871 or from an external voltage connected to *J16*.

Table 3-1. Default Component Values

Designator	Default	Comment
J11	Closed	USB Voltage from Curiosity Nano
J16	Not Mounted	1x2 2.54mm pitch pin header, MCP73871 input voltage and GND
J14	Not Mounted	1x2 2.54mm pitch pin header, 5.0V output (MCP1642B)
J15	Not Mounted	1x2 2.54mm pitch pin header, 3.3V output (MIC33050)
R11	Mounted, 0Ω	MIC33050 output connection to VTG_P3V3 net
R12	Mounted, 0Ω	Curiosity Nano VCC connection to VTG_P3V3 net
R15	Mounted, 0Ω	Curiosity Nano $\overline{\text{VOFF}}$ pin connection to GND
R16	Mounted, 0Ω	5.0V connection to mikroBUS socket 1
R17	Mounted, 0Ω	5.0V connection to mikroBUS socket 2
R18	Mounted, 0Ω	5.0V connection to mikroBUS socket 3

3.3 Curiosity Nano Adapter Battery Charger

The board has a MCP73871-2CC battery charger for 4.20V Li-Ion/LiPo batteries with 2-pin JST B2B-PH connectors.

When a battery is connected together with an external power source, the MCP73871 will charge the battery at a maximum current of 500mA. When external power is removed, the MCP73871 will source power from the battery to power the board. The battery charge current can be customized by replacing resistor *R7*, the charge current follows the formula I = 1000V / *R7*.

⚠WARNING Only use Li-Ion/LiPo batteries with a nominal voltage of 4.20V, and batteries that can handle a charge current of 500mA or more.

Info: The battery can be connected/disconnected with the slider switch at the upper right corner of the board.

Input current to the MCP73871 is limited to 500mA with the default board settings. With a battery connected, the MCP73781 will power the board with whatever current it requires and use the remaining current to charge the battery.

The input current limit can be changed by adjusting the configuration of *J9*, *J10*, *J12*, and *J13* according to the table below.

Table 3-2. MCP73871 Input Current Limit Settings

J9	J10	J12	J13	MCP73871 Current Limit [mA]
Open	Closed	Closed	Open	80 to 100
Open	Closed	Open	Closed	80 to 100
Closed	Open	Closed	Open	1500 to 1800
Closed	Open	Open	Closed	400 to 500 (default)

⚠WARNING All combinations not listed in the table are invalid and will cause a short-circuit between the input voltage and ground.

If the battery is attached to the back of the board in the designated area, a thermistor can be mounted in footprint *TH1* to enable the thermal protection feature in the MCP73871. Remove *R21* when the thermistor is attached. As an example, using a 10kΩ NTC with β parameter of 3590 will allow charging between approximately 4°C and 43°C.

Three status signals from the MCP73871 are connected to LEDs located at the upper edge of the board. The table below shows the different LED combinations.

Table 3-3. MCP73871 Status LEDs

S1	S2	PS	Status
Off	Off	Off	Shutdown/no power

...........continued

S1	S2	PS	Status
Off	Off	On	Shutdown/no battery connected
On	Off	On	Battery charging
Off	On	On	Battery charge complete
On	Off	Off	Low battery output
On	On	On	Temperature/timer fault

Table 3-4. Default Component Values

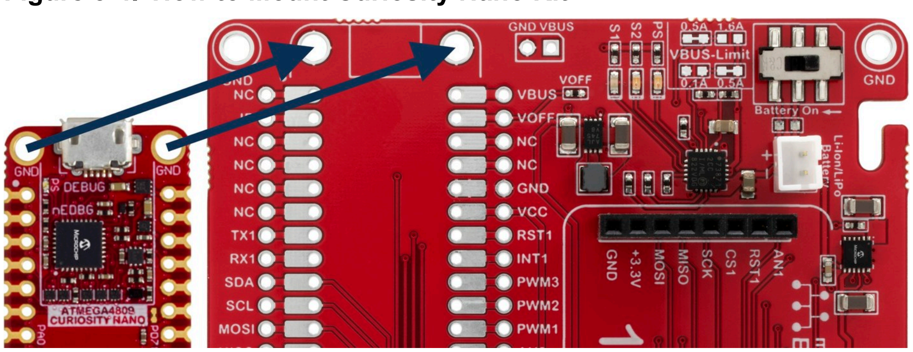
Designator	Default	Comment
J9	Closed	MCP73871 current limit setting
J10	Open	
J12	Open	
J13	Closed	
R20	Not Mounted	Battery switch bypass, solder 0 ohm to permanently connect the battery to the MCP73871
R7	Mounted, 2kΩ	Sets the battery charge current
R21	Mounted, 10kΩ	Battery thermal protection feature of the MCP73871
TH1	Not Mounted	

3.4 Curiosity Nano Adapter Mounting

Connecting a Curiosity Nano kit to the Curiosity Nano Adapter board can be done in several ways. The most practical way is to solder the sockets to the Curiosity Nano Adapter board and the headers to the Curiosity Nano kit. It is also possible to skip the header and socket, and solder the Curiosity Nano kit directly to the Curiosity Nano Adapter board.

Align the USB connector on the Curiosity Nano kit with the upper edge of the Curiosity Nano Adapter as shown in the image above to connect the board correctly.

Figure 3-4. How to Mount Curiosity Nano Kit



The images below shows examples of ATmega4809 Curiosity Nano and PIC16F18446 Curiosity Nano mounted through pin-headers and pin-sockets.

Figure 3-5. ATmega4809 Curiosity Nano kit mounted on Curiosity Nano Adapter

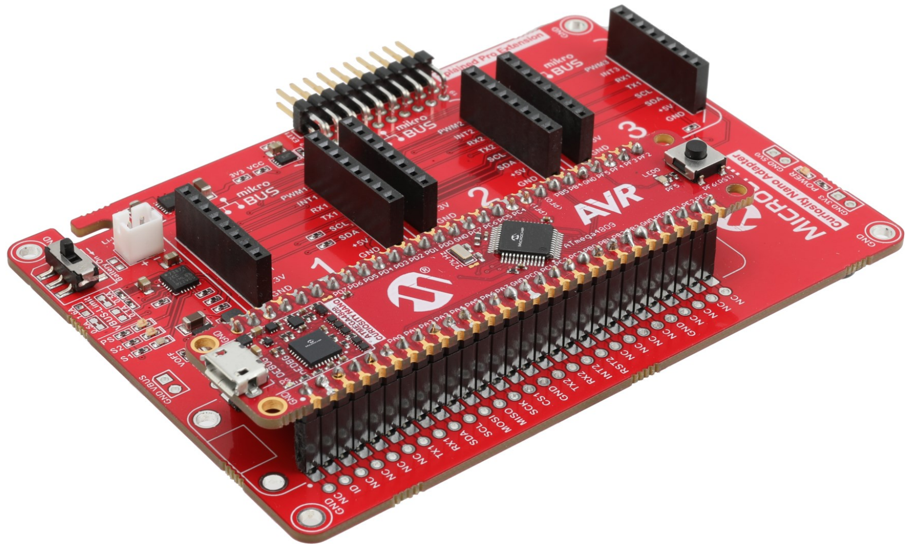
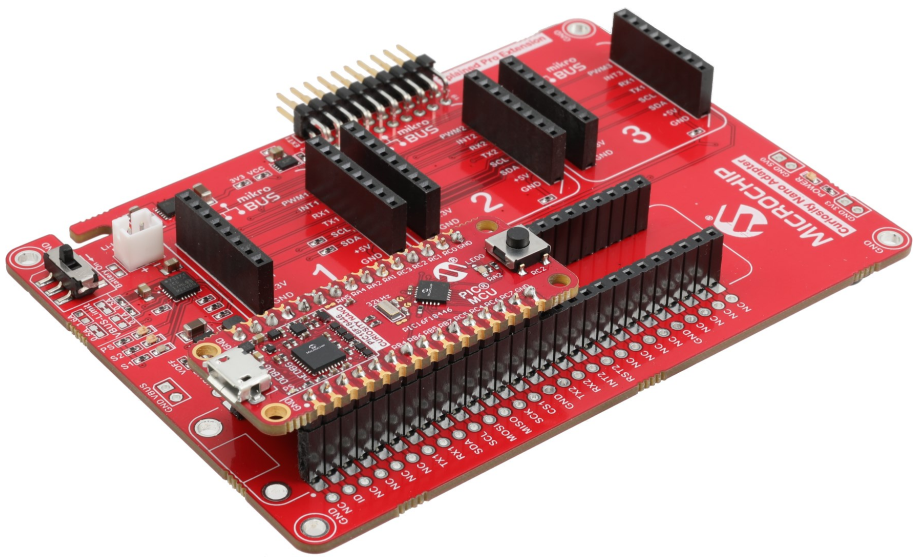


Figure 3-6. PIC16F18446 Curiosity Nano kit mounted on Curiosity Nano Adapter



4. Hardware Revision History

This user guide provides the latest available revision of the kit. This chapter contains information about known issues, a revision history of older revisions, and how older revisions differ from the latest revision.

4.1 Identifying Product ID and Revision

The revision and product identifier of the Curiosity Nano Adapter can be found in two ways; either through Atmel Studio/Microchip MPLAB® X IDE or by looking at the sticker on the bottom side of the PCB.

By connecting a Curiosity Nano Adapter to a computer with Atmel Studio/Microchip MPLAB® X IDE running, an information window will pop up. The first six digits of the serial number, which is listed under kit details, contain the product identifier and revision.

The same information can be found on the sticker on the bottom side of the PCB. Most kits will print the identifier and revision in plain text as A09-nnnn\rr, where “nnnn” is the identifier and “rr” is the revision. The boards with limited space have a sticker with only a QR-code, containing the product identifier, revision and the serial number.

The serial number string has the following format:

```
"nnnnrrssssssssss"
n = product identifier
r = revision
s = serial number
```

The product identifier for Curiosity Nano Adapter is A09-3206.

4.2 Revision 3

Revision 3 is the initially released revision.

5. Document Revision History

Doc. rev.	Date	Comment
A	1/2019	Initial document release.

6. Appendix

6.1 Assembly Drawing

Figure 6-1. Curiosity Nano Adapter Assembly Drawing Top

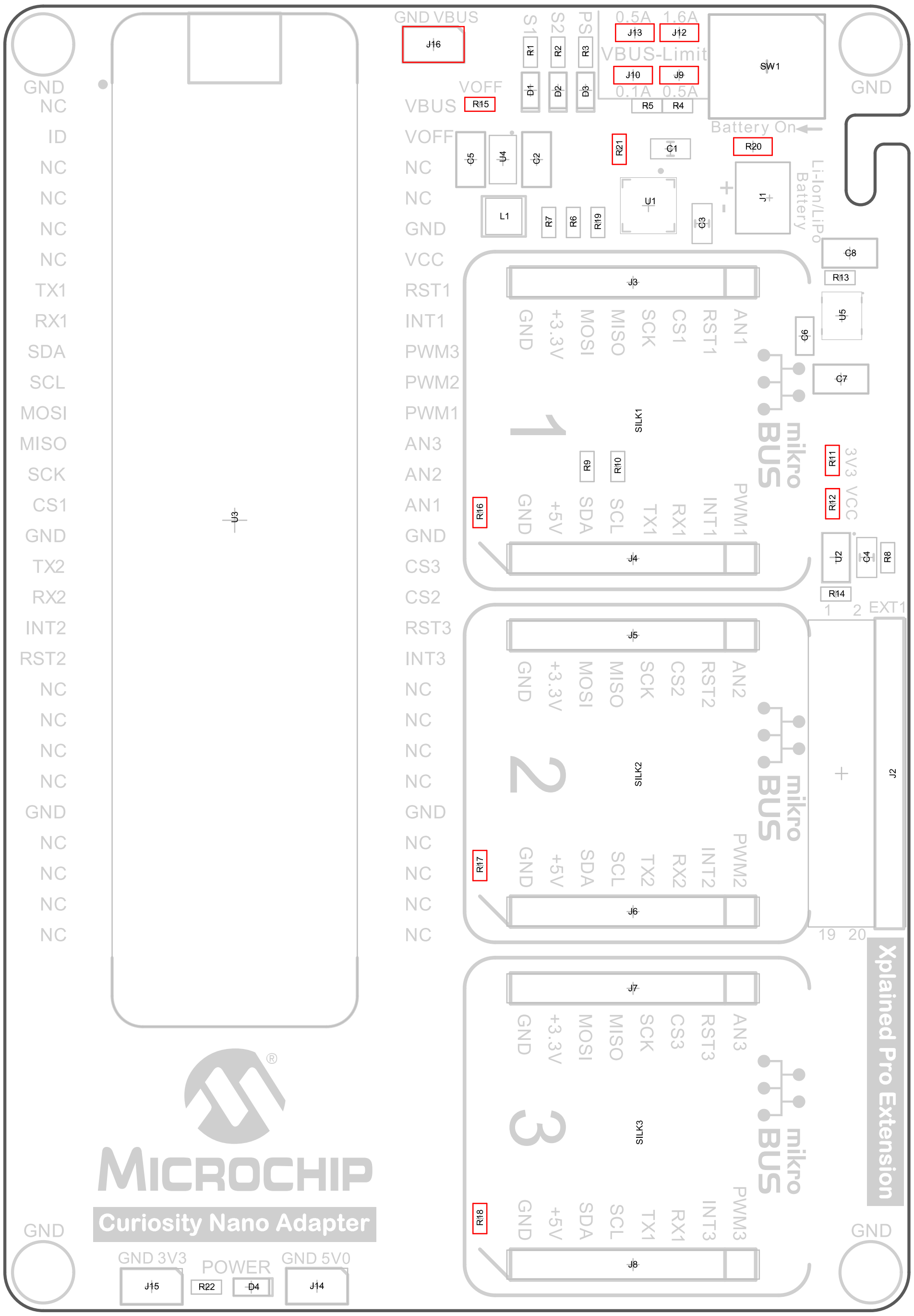
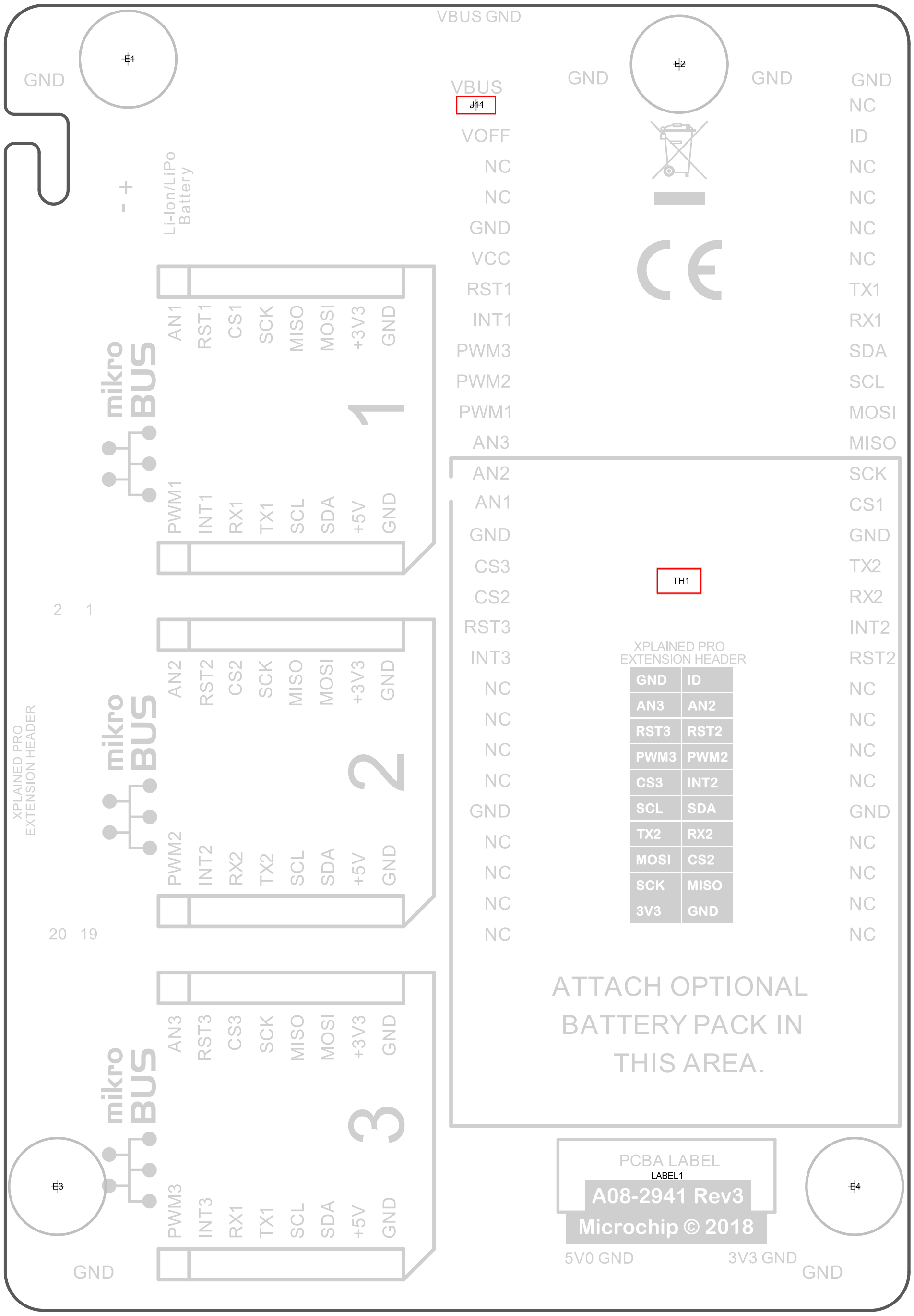
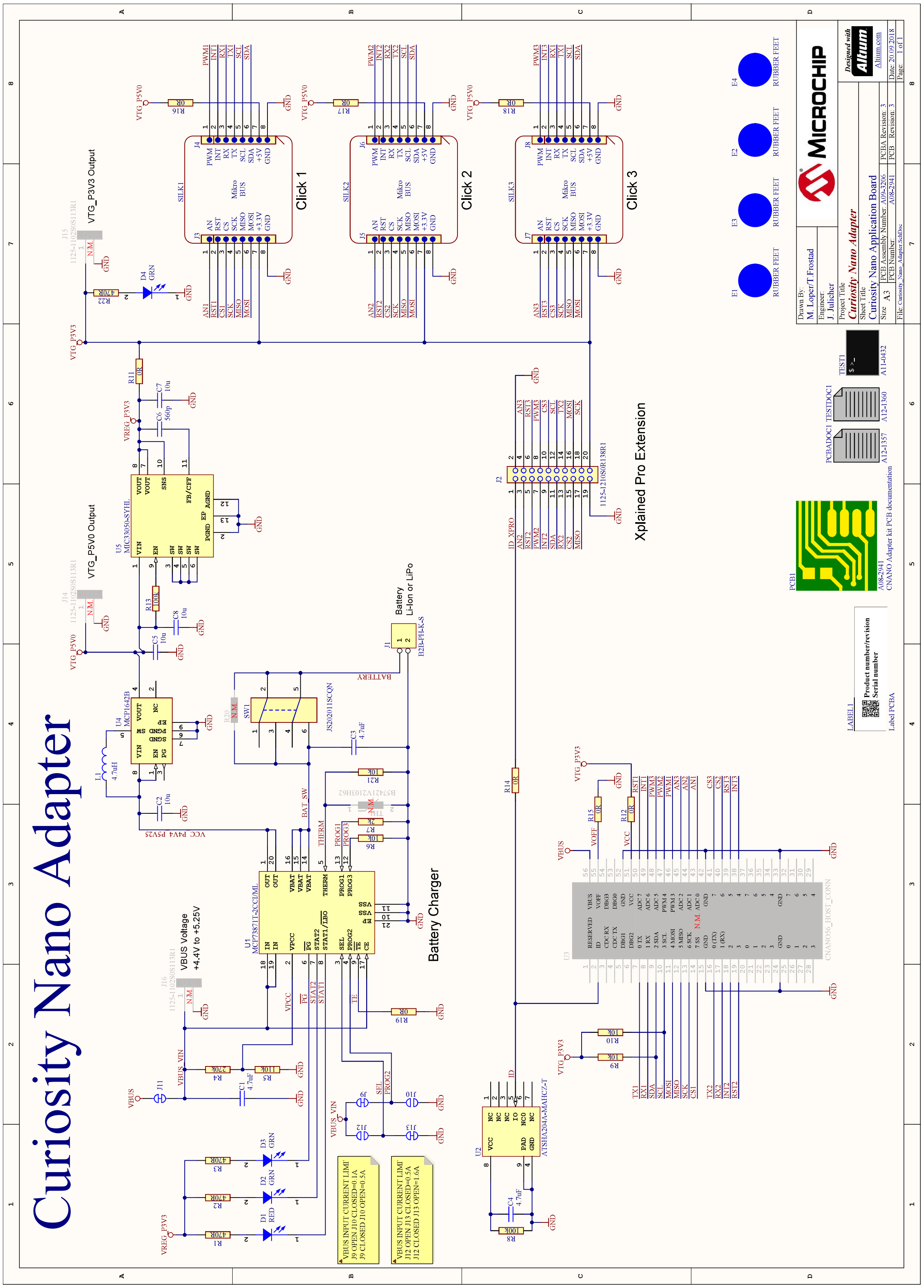


Figure 6-2. Curiosity Nano Adapter Assembly Drawing Bottom



6.2 Schematic

Figure 6-3. Curiosity Nano Adapter Schematic



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