Seeed Studio XIAO Series

System-on-Modules (SoM)
User Manual

seeed studio

Foreword

Why need this SoM User Manual?

The SoM User Manual opens-sources XIAO hardware and software materials, providing professional product design guidelines to help you accelerate your ideas off the ground.

XIAO is a series of dev boards with a compact design, thumb-sized form factor, powerful processors, and rich peripherals. As a complete microcontroller, it can act as a building block for larger compute systems so as to simplify the process of designing and building complex electronic systems by providing a pre-integrated and tested platform. By adopting XIAO, you can focus on creating the unique features and functions of your system, without having to worry about the time and effort involved in integrating and testing the individual components.

The potential of XIAO Series in various vertical application scenarios has been explored, including mechanical keyboards, trackers, detection tools, wearable devices, and healthcare devices, to name a few. XIAO Series is fully ready to be integrated into differentiated devices as a board-level circuit that provides core components of an embedded processing system.

This User Manual can provide everything needed from module selection to the final manufacturing. The introduction (**1.**) will provide general information about the whole XIAO Series and the outstanding features of each XIAO module. Thorough and complete file lists of each XIAO are presented in Table of Contents (**2.3.4.5**) respectively through which you can easily pinpoint the information of the XIAO that you decide to incorporate into your design. Notification (**6.**) mainly focuses on the points that need your special attention when using XIAO. PCBA Service (**7.**) is where you can make the ideas become substantial and commercial products. Application (**8.**) displays doable application directions to give you some inspiration.

Brief Selection Guide of XIAO

XIAO means Tiny in Chinese. The whole series includes XIAO SAMD21, XIAO RP2040, XIAO nRF52840, XIAO nRF52840 Sense, and XIAO ESP32C3. As the most classic one among XIAO, XIAO SAMD21 has strong stability and compatibility, XIAO SAMD21 has been sought after and applied by musical gadgets. XIAO RP2040 is compatible with the Raspberry Pi RP2040 ecosystem and has been widely used in mechanical keyboards. Supporting Bluetooth 5.0, XIAO nRF52840 shows its potential in environmental data collection, detection tools, and smart home devices in which wireless communication plays an important role. XIAO nRF52840 Sense features an onboard microphone and 3-axis IMU and also supports Bluetooth 5.0, which makes it perfect for TinyML and AIoT projects. XIAO ESP32C3 is a low-cost, high-performance RISC-V IoT development board that supports Bluetooth&WiFi, it has shown its power in becoming a powerful module on trackers.

Name	XIAO SAMD21	XIAO RP2040	XIAO nRF52840	XIAO nRF52840 Sense	XIAO ESP32C3
One-Sentence Description	- A universal mini dev board with strong stability and compatibility	- Compatible with the Raspberry Pi RP2040 ecosystem	- Mini low-power consumption dev board supporting Bluetooth 5.0	- Advanced version of XIAO nRF52840 with onboard microphone and 3-axis IMU	- Budget-friendly and high-performance RISC-V WiFi&BLE dev board
Recommended Application	- Controller for 3D Printers - Trackers - Musical gadgets	- Mechanical - Keyboards	- Environmental data collection - Detection tools - Smart home devices	- TinyML and AIoT projects	- Smart home devices - AIoT projects

Seeed Ecosystem

Seeed Studio is the IoT hardware partner for digital innovators. Seeed works closely with global technology ecosystems to provide hardware modules, devices, and related services. We grow ideas into differentiating products by providing easily accessible technologies with quality and delivery guaranteed. We combine Shenzhen's agile manufacturing resources with Seeed's global sales experience, including sourcing, manufacturing, marketing, logistics, and warehousing services. It is Seeed's mission to become the most reliable hardware platform and to empower digital pioneers to achieve their digital transformation goals. Whether it is a bare idea, a feasible prototype, or a mature product, Seeed serves anyone looking for robust customization and manufacturing.

Table of Content

1. Introduction

A System-on-Module (SoM) is a type of computer system that is integrated onto a single module and is designed to be used as a building block for larger systems. Seeed Studio XIAO is a series of thumb-sized System-on-Modules (SoM) that provides various core components of an embedded processing system, including the processor core, communication interface, and memory module to a single printed circuit board (PCB) ready for production.

"XIAO" means tiny in Chinese, tiny but powerful. Powerful and popular chips like SAMD21, nRF52840, RP2040, and ESP32C3 empower XIAO modules. Its compact and fully-integrated design makes it possible for many applications. In addition, all SMD components are placed on the same side of the board so that designers can easily integrate XIAO into their own boards for rapid mass production.
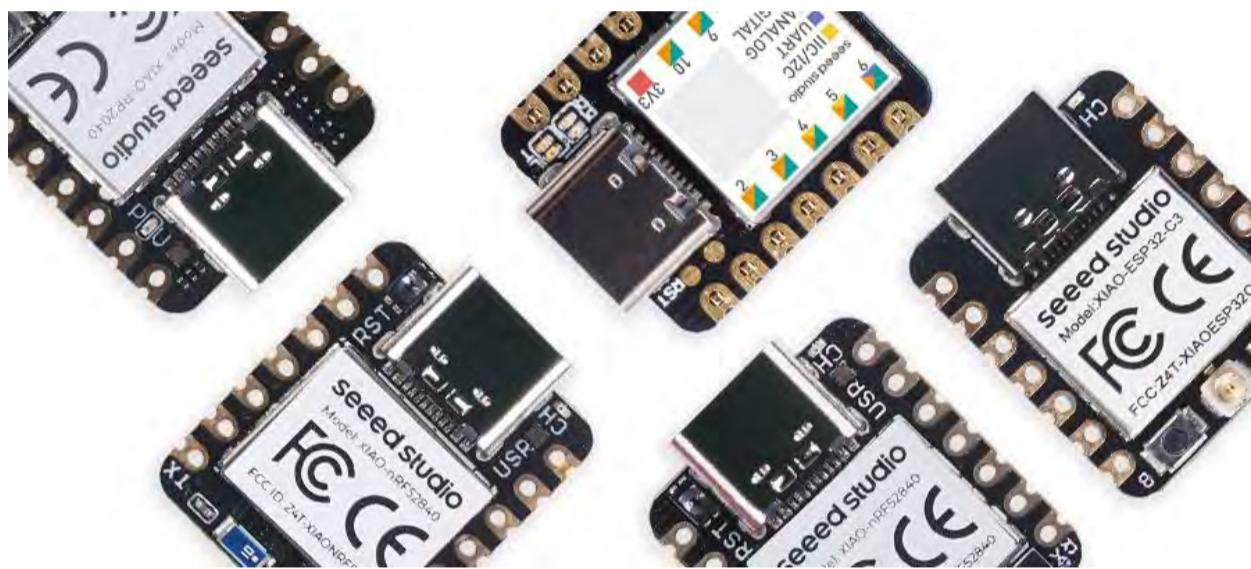
1.1 Features of XIAO Series

- Ultra Small Size: XIAO series come in a standard thumb-sized form factor, only 21x17.5mm. Made for space-constrained scenarios.
- Rich Interface: Up to 11 available IOs support multiple interfaces, including analog, digital, IIC, UART, SPI, and more.
- Powerful and Popular MCUs: Powerful core with a strong performance for diverse and complex applications.
- SMD Design: Single-sided components, surface mounting design. Easily integrate XIAO into other boards for mass production.

1.2 Description of XIAO SoM

Seeed Studio XIAO SAMD21

Seeed Studio XIAO SAMD21 carries the powerful ATSAMD21G18A-MU and has 14 PINs, which can be used for 11 digital interfaces, 11 mock interfaces, 10 PWM interfaces (d1-d10), 1 DAC output pin D0, 1 SWD pad interface, 1 I2C interface, 1 SPI interface, 1 UART interface, Serial communication indicator (T/R), Blink light (L) through pin multiplexing. It needs to be noted that these functions are achieved through pin reuse. The colors of LEDs (Power, L, RX, TX) are green, yellow, blue, and blue. Moreover, Seeed Studio XIAO SAMD21 has a Type-C interface that can supply power and download code. There are two reset contact point, you can short-connect them to reset the board.
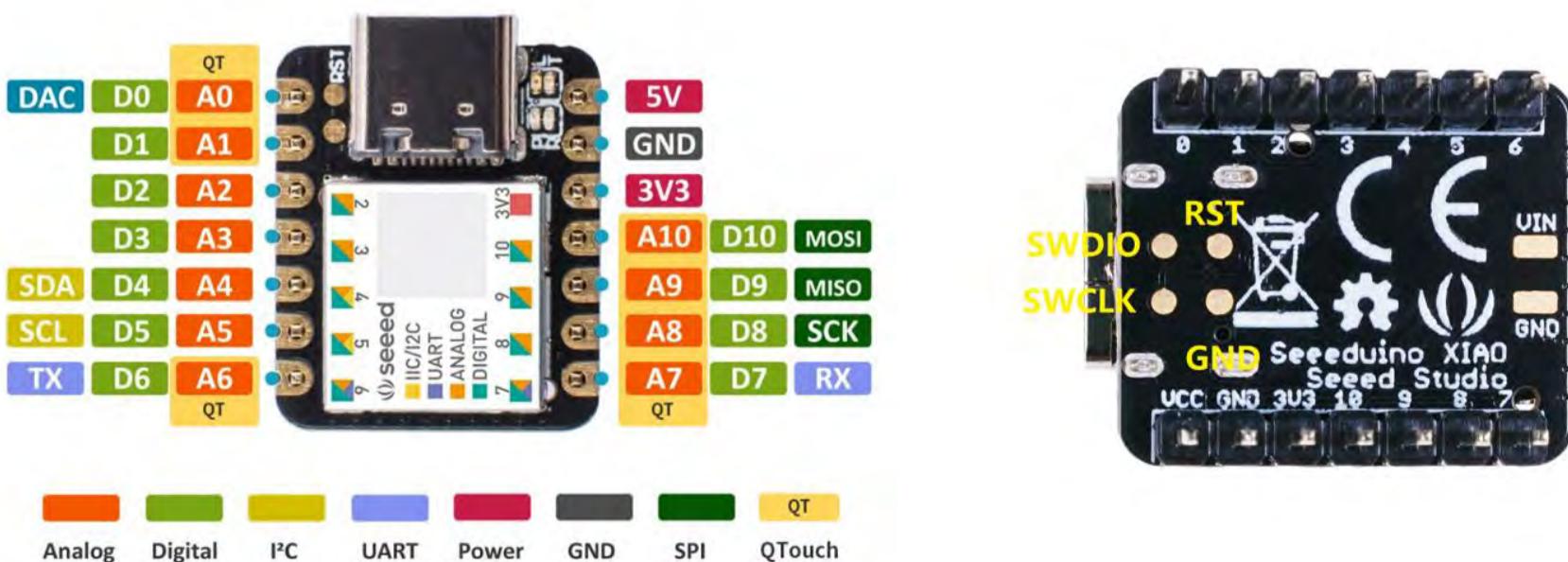
Item	Value
CPU	ARM Cortex-M0+ CPU(SAMD21G18) running at up to 48MHz
Flash Memory	256KB
SRAM	32KB
Digital I/O Pins	11
Analog I/O Pins	11
I2C interface	1
SPI interface	1
QTouch	7 (A0,A1,A6,A7,A8,A9,A10)
UART interface	1
Power supply and downloading interface	Type-C
Power	3.3V/5V DC
Dimensions	20×17.5×3.5mm
Programming Language	Arduino, CircuitPython and Micropython

Table 1: Present Key Specification of XIAO SAMD21

Seeed Studio XIAO RP2040

The Seeed Studio XIAO RP2040 is as small as the Seeed Studio XIAO SAMD21 but it's more powerful. It carries a powerful Dual-core RP2040 processor that can flexible clock running up to 133 MHz which is a low-power microcontroller. There is also 264KB of SRAM, and 2MB of onboard Flash memory which can provide more programs to save and run. Apart from that, this little board has good performance in processing but needs less power. There are 14 GPIO PINs on Seeed Studio XIAO RP2040, which include 11 digital pins, 4 analog pins, 11 PWM Pins,1 I2C interface, 1 UART interface, 1 SPI interface, 1 SWD Bonding pad interface.
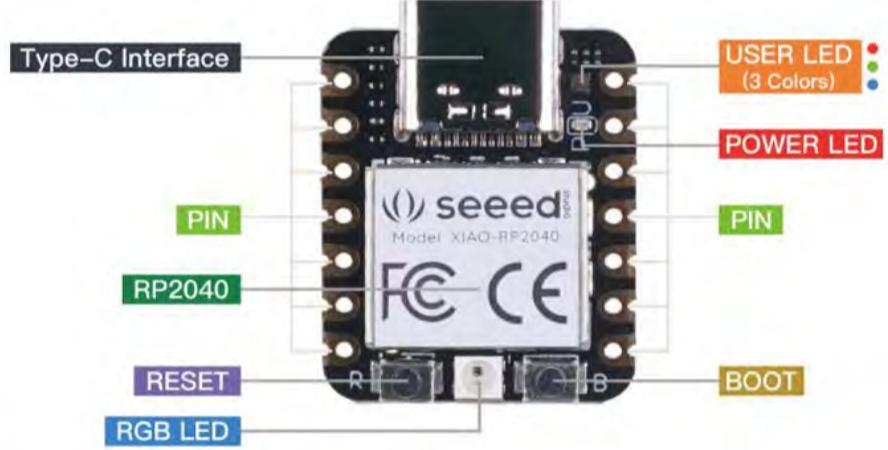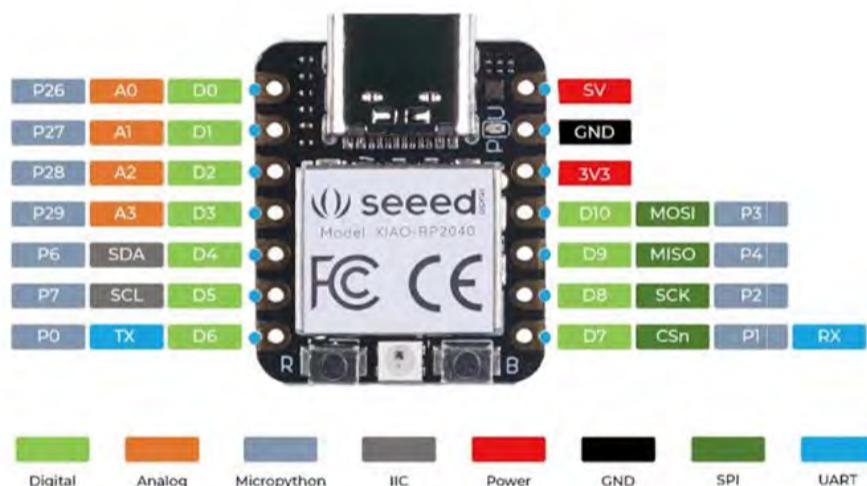
Item	Value
CPU	Dual-core ARM Cortex M0+ processor up to 133MHz
Flash Memory	2MB
SRAM	264KB
Digital I/O Pins	11
Analog I/O Pins	4
PWM Pins	11
I2C interface	1
SPI interface	1
UART interface	1
Power supply and downloading interface	Type-C
Power	3.3V/5V DC
Dimensions	20×17.5×3.5mm
Programming Language	Arduino/Circuitpython/Micropython

Table 2: Present Key Specification of XIAO RP2040

Seeed Studio XIAO nRF52840 / Sense

Seeed Studio XIAO nRF52840 is equipped with a powerful **Nordic nRF52840 MCU** which integrates **Bluetooth 5.0** connectivity. Meanwhile, it has a small and exquisite form-factor that can be used for wearable devices and Internet of Things projects. The **single-sided surface-mountable design** and the onboard **Bluetooth antenna** can greatly facilitate the rapid deployment of IoT projects.

In addition, there is an advanced version of this board, **Seeed Studio XIAO nRF52840 Sense**. It is integrated with two extra onboard sensors. One of them is a **Pulse Density Modulation (PDM) Digital Microphone**. It can receive audio data in real time which allows it to be used for audio recognition. The other one is a **6-axis Inertial Measurement Unit (IMU)**, this IMU can be very useful in TinyML projects like gesture recognition. These onboard sensors provide great convenience for users while the board is ultra-small.

Compared to Seeed Studio XIAO RP2040, Seeed Studio XIAO nRF52840 contains **richer interfaces**. The first thing to note is that the **Near Field Communication (NFC) interface** is functional on the board. Secondly, there is a tiny **reset button** on the side of the Type-C interface. On the other side, there is a **3-in-one LED (User LED)** along with a **Charge LED** to indicate the charging status when a battery is connected. There are **11 digital I/O** that can be used as **PWM pins and 6 analog I/O** that can be used as **ADC pins**. It supports all three common serial interfaces such as **UART, I2C, and SPI**. Same as Seeed Studio XIAO RP2040, it has an **onboard 2 MB flash** which means it can also be programmed using **Arduino, MicroPython, CircuitPython, or other programming languages**.
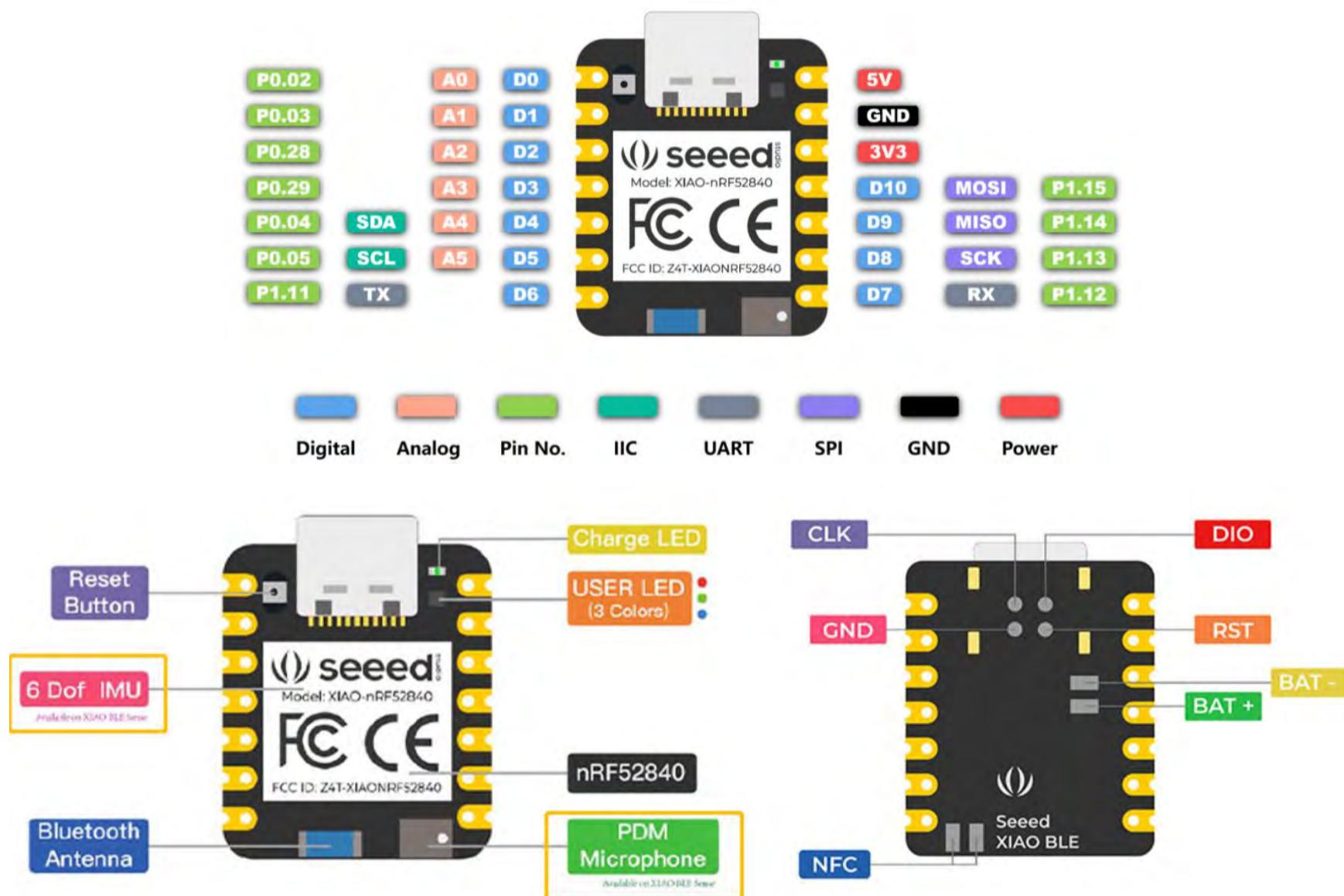
(Notice: 6 Dof IMU and PDM Microphone are only available on XIAO nRF52840 SENSE)

Item	Seeed Seeed Studio XIAO nRF52840	Seeed Seeed Studio XIAO nRF52840 Sense
Processor	nRF52840 M4F@64MHz	nRF52840 M4F@64MHz
Wireless Connectivity	Bluetooth 5.0/BLE/NFC	Bluetooth 5.0/BLE/NFC
Memory	256 KB RAM, 1MB Flash 2MB onboard Flash	256 KB RAM, 1MB Flash 2MB onboard Flash
Built-in Sensors	N/A	6 DOF IMU (LSM6DS3TR-C), PDM Microphone
Interfaces	I2C/UART/SPI	I2C/UART/SPI

Item	Seeed Seeed Studio XIAO nRF52840	Seeed Seeed Studio XIAO nRF52840 Sense
PWM/Analog Pins	11/6	11/6
Onboard Buttons	Reset Button	Reset Button
Onboard LEDs	3-in-one LED/ Charge LED	3-in-one LED/ Charge LED
Battery Charge Chip	BQ25101	BQ25101
Programming Languages	Arduino/ MicroPython/ CircuitPython	Arduino/ MicroPython/ CircuitPython

Table 3: Present Key Specification of XIAO nRF52840/Sense

Seeed Studio XIAO ESP32C3

Seeed Studio XIAO ESP32C3 is an IoT mini development board based on the **Espressif ESP32-C3 WiFi/Bluetooth dual-mode chip**. ESP32-C3 is a **32-bit RISC-V CPU**, which includes an **FPU** (Floating Point Unit) for **32-bit single-precision arithmetic** with powerful computing power. It has excellent radio frequency performance, supporting **IEEE 802.11 b/g/n WiFi**, and **Bluetooth 5 (LE) protocols**. This board comes included with an external antenna to increase the signal strength for your wireless applications. It also has a small and exquisite form factor combined with a single-sided surface-mountable design. It is equipped with rich interfaces and has **11 digital I/Os** that can be used as **PWM pins** and **4 analog I/Os** that can be used as **ADC pins**. It supports four serial interfaces such as **UART, I2C, SPI, and I2S**. There is also a small **reset button** and **a bootloader mode button** on the board.

XIAO ESP32C3 is fully compatible with the Grove Shield for Seeeduino XIAO except for the Seeeduino XIAO Expansion board, the SWD spring contacts on the board will not be compatible. With regard to the features highlighted above, XIAO ESP32C3 is positioned as a high-performance, low-power, cost-effective IoT mini development board, suitable for low-power IoT applications and wireless wearable applications.
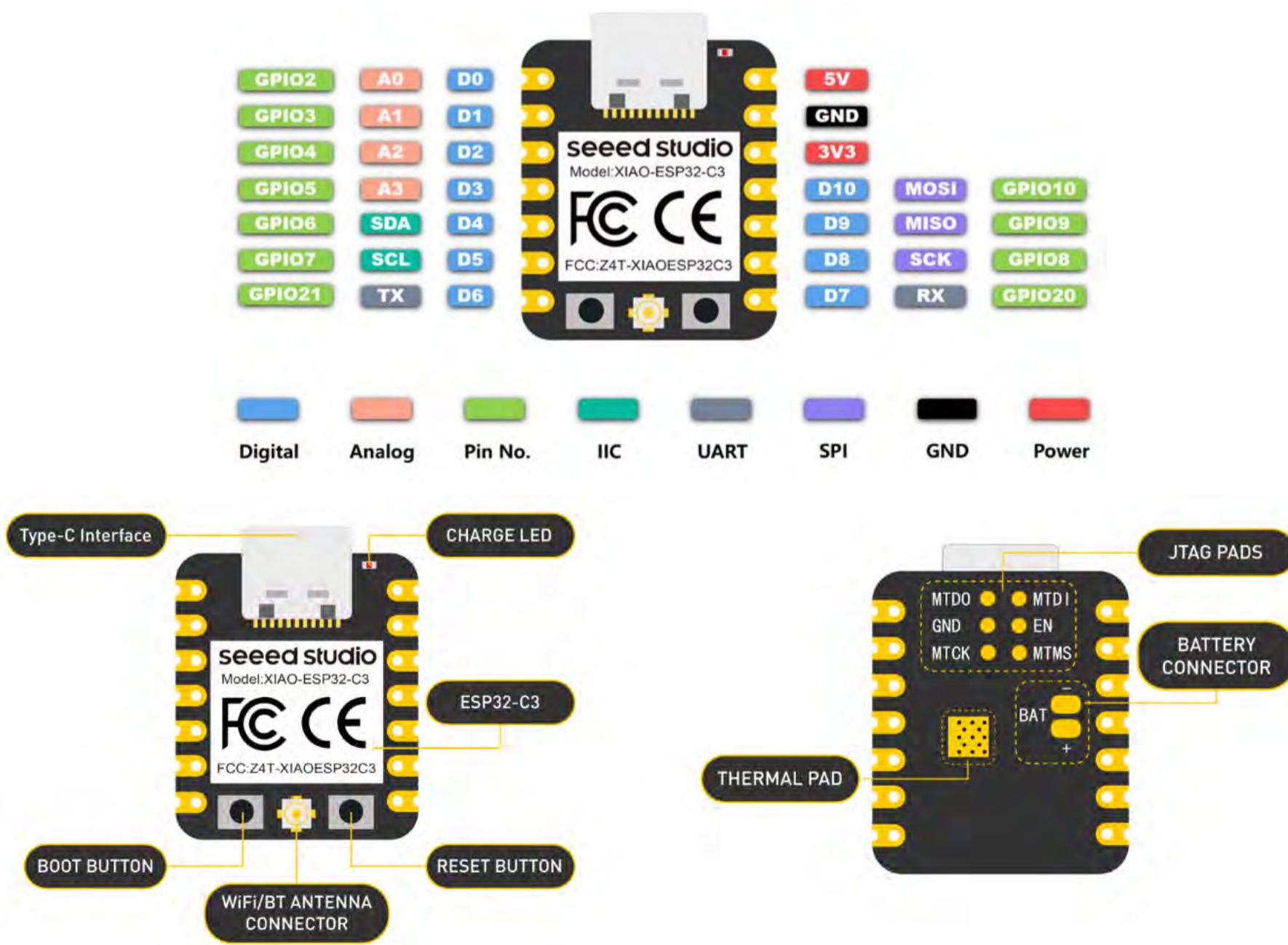
Item	Seeed Seeed Studio ESP32C3
Processor	ESP32-C3 32-bit RISC-V @160MHz
Wireless Connectivity	WiFi and Bluetooth 5 (LE)
Memory	400KB SRAM, 4MB onboard Flash
Built-in Sensors	N/A
Interfaces	I2C/UART/SPI/I2S
PWM/Analog Pins	11/4
Onboard Buttons	Reset and Boot Button
Onboard LEDs	Charge LED
Battery Charge Chip	Built-in
Programming Languages	Arduino

Table 4: Present Key Specification of XIAO ESP32C3

1.3. XIAO Series Comparison Table

	Seeed Studio XIAO SAMD21	Seeed Studio XIAO RP2040	Seeed Studio XIAO nRF52840	Seeed Studio XIAO nRF52840 Sense	Seeed Studio XIAO ESP32C3
	Hardware				
Processor	SAMD21	RP2040	nRF52840	nRF52840	ESP32C3
RAM	32 KB SRAM	264 KB SRAM	256 KB RAM	256 KB RAM	400 KB SRAM
Flash(chip)	256KB	×	1MB	1MB	4MB
Flash(onboard)	×	2MB	2MB	2MB	×
Built-in Sensors	×	×	×	IMU, Microphone	×
PWM/Analog Pins	11/11	11/4	11/6	11/6	11/4
I2C/UART/SPI	√	√	√	√	√
Bluetooth	×	×	√	√	√
WiFi	×	×	×	×	√
Reset Button	√ (Contact Point)	√	√	√	√
Boot Button	√ (Contact Point)	√	√	√	√
User LED	√	√	√	√	×

	Seeed Studio XIAO SAMD21	Seeed Studio XIAO RP2040	Seeed Studio XIAO nRF52840	Seeed Studio XIAO nRF52840 Sense	Seeed Studio XIAO ESP32C3
Hardware					
Battery Charge LED	×	×	√	√	√
Baterry Charge IC	×	×	√	√	√
Low power mode	×	×	<5µA	<5µA	<44µA
Programming Languages					
Arduino	√	√	√	√	√
CircuitPython	√	√	√	√	×
MicroPython	×	√	√	√	×

Table 5: XIAO Series Comparison

1.4. Ordering Information

Name	SKU	Product Life
Seeed Studio XIAO SAMD21	102010328	3 years+*
Seeed Studio XIAO RP2040	102010428	3 years+*
Seeed Studio XIAO nRF52840	102010448	3 years+*
Seeed Studio XIAO nRF52840 Sense	102010469	3 years+*
Seeed Studio XIAO ESP32C3	113991054	3 years+*

Note*: Count from the release date of this User Manual.

   Currently, our minimum order quantity (MOQ) is set at 500 pieces. However, we may adjust this requirement in the future based on various factors and situations and update here.

2. Seeed Studio XIAO SAMD21

2.1 Functional Introduction

2.1.1 Chip Datasheet

A low-power, high-performance Microchip's ARM® Cortex®-M0+ based flash microcontroller, the ATSAMD21G18 is ideal for a wide range of home automation, consumer, metering, and industrial applications. It features:

● 256KB of flash and 32KB of SRAM

● Up to 48MHz operating frequency

● Six serial communication modules (SERCOM) configurable as UART/USART, SPI or I2C, three 16-bit timer/counters, 32-bit Real-Time Clock and calendar, 20 PWM channels, one 14-channel 12-bit ADC, one 10-bit DAC

● Full Speed USB Device and embedded Host

● Support for up to 120 touch channels

● 1.62V to 3.63V power supply

Download Datasheet

2.1.2 Pinout Reference
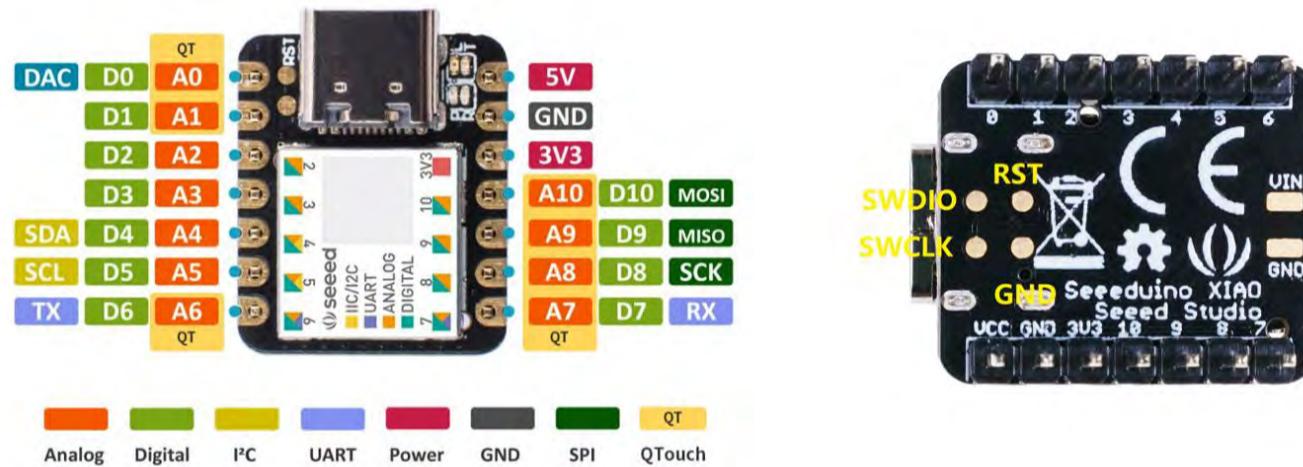
2.1.3 Power Consumption

Normal: 14.5mA

2.1.4 Operating Voltage

Operating Voltage is **5 V (Type-C)**

2.1.5 Hardware and Software Feature

Additional Functionality of XIAO SAMD21

DAC (Digital to Analogue Converter): Support battery supply, but only one time, since the board doesn't have a battery charge chip

Software Tutorials

Seeed Studio XIAO SAMD21 as USB device (TinyUSB)

SPI Communication on Seeed Studio XIAO SAMD21

TinyML on Seeed Studio XIAO SAMD21

Seeed Studio XIAO SAMD 21 DAPLink

How to use Seeed Studio XIAO SAMD21 to log in to your Raspberry PI

How to unbrick a dead xiao using raspberry pi

There are two documentations on the usage of Seeed Studio XIAO SAMD21 which focus on different areas, check the table below for reference:

Documentation by Seeed	Documentation by Nanase
Pinout Diagram	Interface
Seeed Studio XIAO SAMD21 Getting Started	Seeed Studio XIAO SAMD21 with MicroSD Card(SPI)
Seeed Studio XIAO SAMD21 GPIO Usage	Seeed Studio XIAO SAMD21 with GPS(UART)
Seeed Studio XIAO SAMD21 Resources	Single Cycle IOBUS

This is a document written by @nanase_coder. (Translated by Seeed from the original Japanese document: コインサイズ Arduino 互換機 Seeed Studio XIAO SAMD21 を使ってみた).

2.1.6 Bootloader

- Standard Bootloader for common PC port identification.
- UF2 Bootloader for CircuitPython usage of PC port identification.

Enter Bootloader Method: wire shoring RST connectors

Sometimes the Seeed Studio XIAO SAMD21 port may disappear when the user programming process fails. we can solve this problem by the following operation:

- Connect the Seeed Studio XIAO SAMD21 to your computer.
- Use tweezers or short lines to short the RST pins in the diagram twice.
- The orange LED lights flicker on and light up.

At this point, the chip enters Bootloader mode and the burning port appears again. Because the samd21 chip has two partitions, one is the Bootloader and the other is the user program. The product will burn a bootloader code in the system memory when it leaves the factory. We can switch modes by performing the above steps.
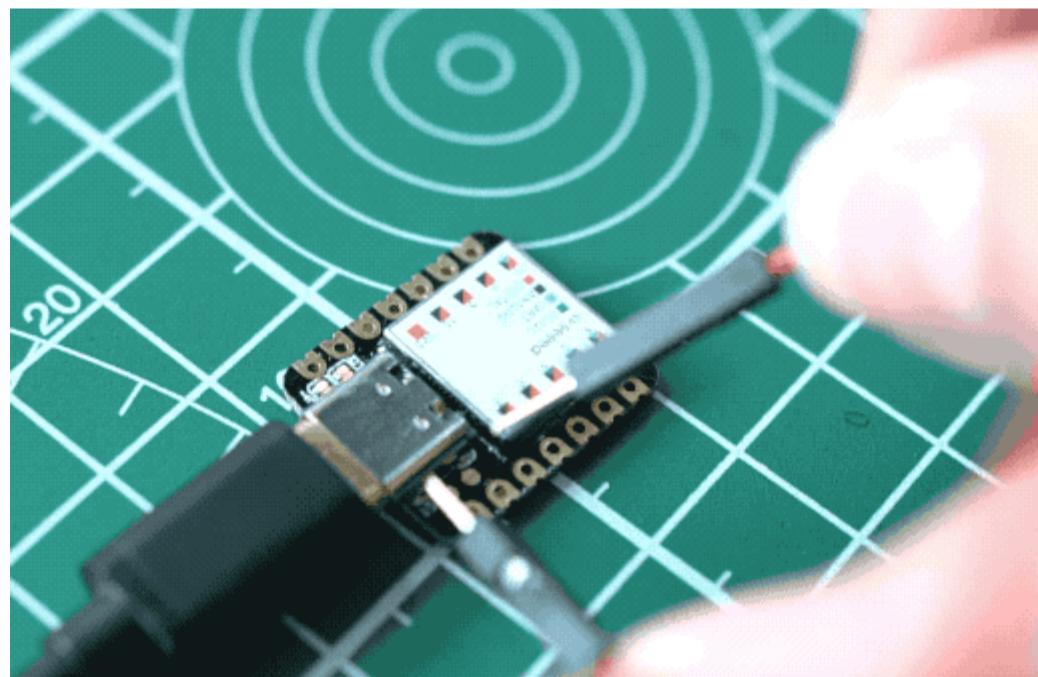
2.1.7 Programming Languages

XIAO SAMD21 supports Arduino, CircuitPython, and MicroPython. Detailed tutorials are provided for each programming language.

Arduino on Seeed Studio XIAO SAMD21

CircuitPython on Seeed Studio XIAO SAMD21

MicroPython on Seeed Studio XIAO SAMD21

2.2 File Resources

2.2.1 PCBA

2.2.1.1 Footprint

[LBR] Seeed Studio XIAO SAMD21 Footprint Eagle

2.2.1.2 Schematic

[PDF] Seeed Studio XIAO SAMD21 Schematic

2.2.1.3 KiCAD Libraries

[ZIP] Seeed Studio XIAO SAMD21 KiCAD Libraries

2.2.1.4 Eagle Libraries

[ZIP] Seeed Studio XIAO SAMD21 Eagle Libraries

2.2.1.5 Dimension in DXF

[DXF] Seeed Studio XIAO SAMD21 Dimension in DXF

2.2.1.6 Factory Firmware

[ZIP] Seeed Studio XIAO SAMD21 Factory firmware

2.2.1.7 Pinout Sheet

[XLSX] Seeed Studio XIAO SAMD21 pinout sheet

2.2.2 Structure

2.2.2.1 STL File

[ZIP] Seeed Studio XIAO SAMD21 STL File

2.2.3 Certification

This file includes CE, EU DoC, FCC, RoHS, and UK DoC.

[ZIP] Seeed Studio XIAO SAMD21 Certification

For Custom Clearance, you may need:

| HSCODE	8543709990
USHSCODE	8543709301
EUHSCODE	8543709099
COO	CHINA

3. Seeed Studio XIAO RP2040

3.1 Functional Introduction

3.1.1 Chip Datasheet

RP2040 is the debut microcontroller from Raspberry Pi. It brings signature values of high performance, low cost, and ease of use to the microcontroller space. With a large on-chip memory, symmetric dual-core processor complex, deterministic bus fabric, and rich peripheral set augmented with our unique Programmable I/O (PIO) subsystem, it provides professional users with unrivalled power and flexibility. With detailed documentation, a polished USB-C port, and a UF2 bootloader in ROM, it has the lowest possible barrier to entry for beginner and hobbyist users.

<div align="center">

Download Datasheet

</div>

3.1.2 Pinout Reference
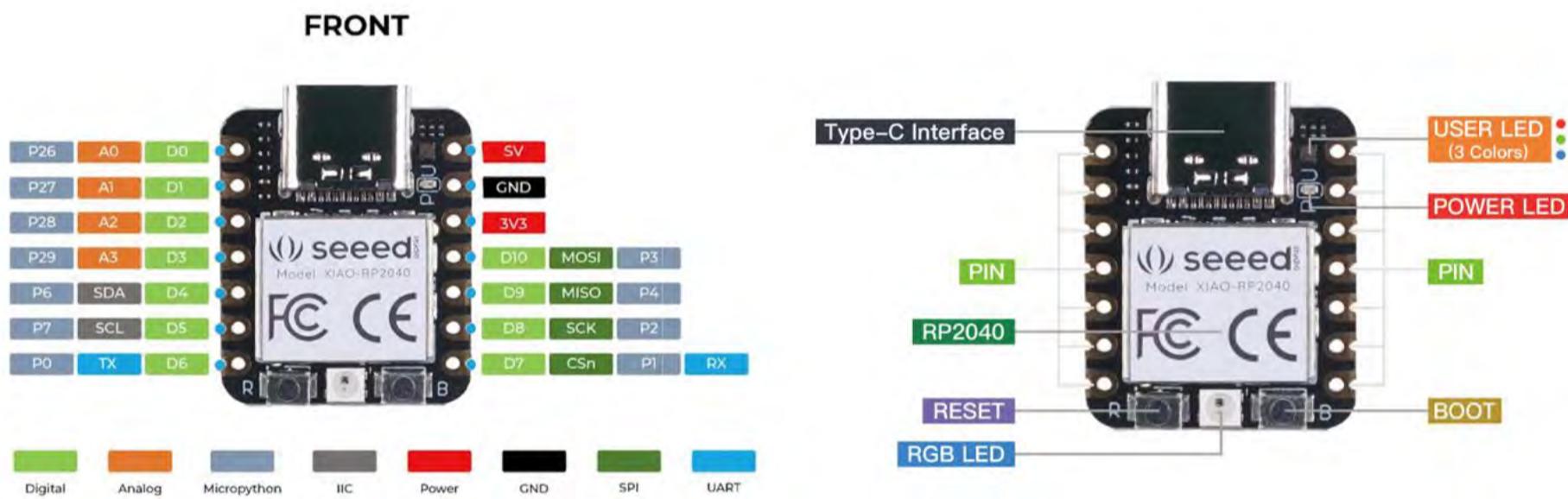
3.1.3 Power Consumption

Normal: 28.9 mA

3.1.4 Operating Voltage and Supply Voltage

Operating Voltage is **5V (Type C)**

3.1.5 Hardware and Software Feature

If you want to reset the Seeed Studio XIAO RP2040, perform the following steps:
- Connect the Seeed Studio XIAO RP2040 to your computer.
- Press the "R" pins once.

Please note: The behavior of the built-in programmable Single-colour LEDs (two are blue, one is green) is reversed to the one on an Arduino. On the Seeed Studio XIAO RP2040, the pin has to be pulled low to enable it.
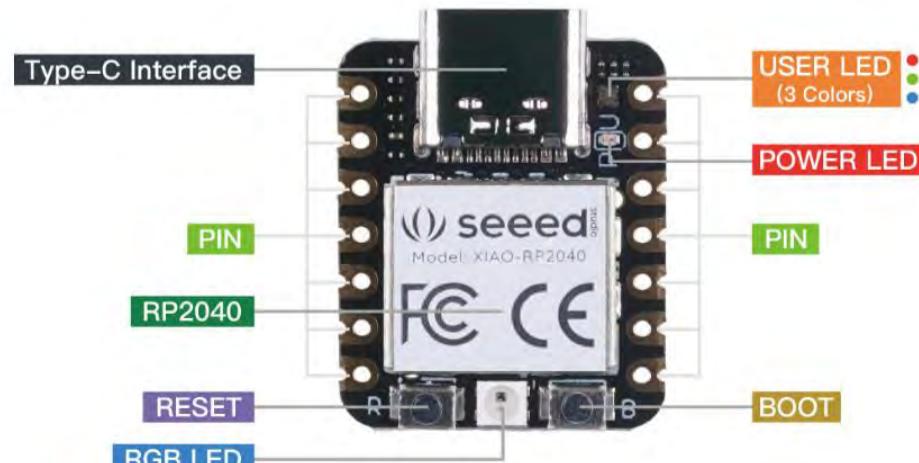
Software Resources

[TinyML on SEEED XIAO RP2040 (Motion Recognition)](#)

3.1.6 Bootloader

- Standard Bootloader for common PC port identification
- UF2 Bootloader for CircuitPython usage of PC port identification

Enter Bootloader Method: Hold "B" button then connect to PC.

Sometimes the Seeed Studio XIAO RP2040 port may disappear when user is programming process fails. we can solve this problem by the following operation:

- Long press the "B" button.
- Connect the Seeed Studio XIAO PR2040 to your computer.
- The computer will appear a disk driver.

At this point, the chip enters Bootloader mode and the burn port appears again. Because the RP2040 chip has two partitions, one is the Bootloader and the other is the user program. The product will burn a bootloader code in the system memory when it leaves the factory. We can switch modes by performing the above steps.

3.1.7 Programming Languages

Seeed Studio XIAO RP2040 has supported Arduino, MicroPython, and CircuitPython programming, and we provide examples for each programming language. You can choose to select from the contents on the left side of the page, or click the hyperlink below:

- [Seeed Studio XIAO RP2040 with Arduino](#)
- [Seeed Studio XIAO RP2040 with MicroPython](#)
- [Seeed Studio XIAO RP2040 with CircuitPython](#)

3.2 File Resources

3.2.1 PCBA

3.2.1.1 Footprint

[LBR] [Seeed Studio XIAO RP2040 Footprint Eagle](#)

3.2.1.2 Schematic

[PDF] [Seeed Studio XIAO RP2040 Schematic](#)

3.2.1.3 KiCAD Libraries

[ZIP] [Seeed Studio XIAO RP2040 KiCAD Libraries](#)

3.2.1.4 Eagle Libraries

[ZIP] [Seeed Studio XIAO RP2040 Eagle Libraries](#)

3.2.1.5 Dimension in DXF

[DXF] [Seeed Studio XIAO RP2040 Dimension in DXF](#)

3.2.1.6 Pinout Sheet

[XLSX] [Seeed Studio XIAO RP2040 pinout sheet](#)

3.2.2 Structure

3.2.2.1 STL File

[ZIP] [Seeed Studio XIAO RP2040 STL File](#)

3.2.3 Certification

This file includes CE, EU DoC, FCC, RoHS, and UK DoC.

[ZIP] Seeed Studio XIAO RP2040 Certification

For Custom Clearance, you can refer to:

| HSCODE	8543709990
USHSCODE	8543709301
EUHSCODE	8543709099
COO	CHINA

4. Seeed Studio XIAO nRF52840 / Sense

4.1 Functional Introduction

4.1.1 Chip Datasheet

The nRF52840 SoC is the most advanced member of the nRF52 Series. It meets the challenges of sophisticated applications that need protocol concurrency and a rich and varied set of peripherals and features. It offers generous memory availability for both Flash and RAM, which are prerequisites for such demanding applications.

Download Datasheet

4.1.2 Pinout Reference
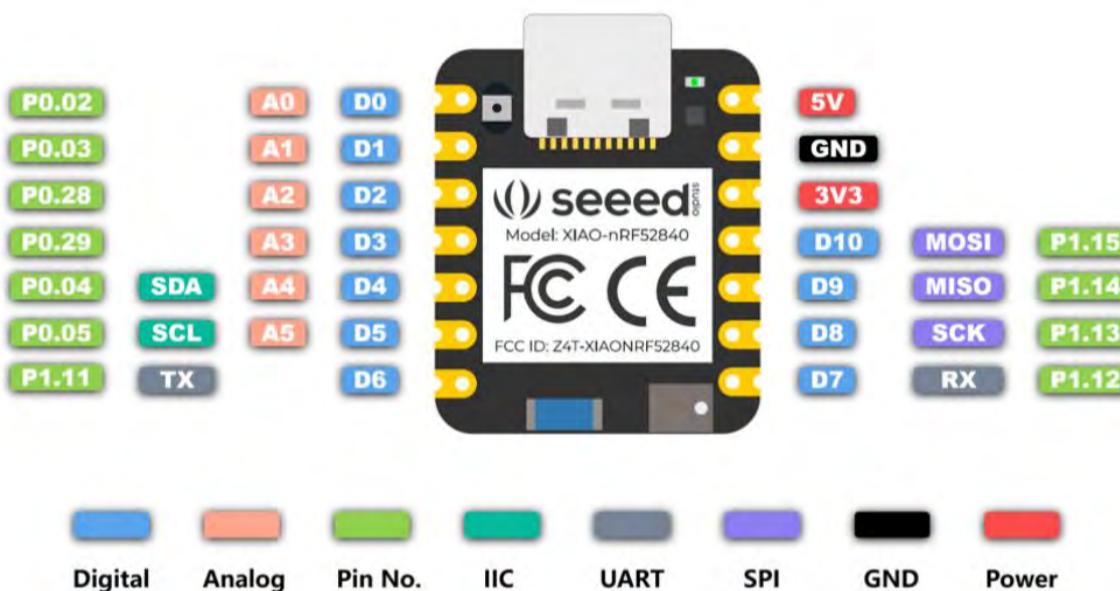
4.1.3 Power Consumption

XIAO nRF52840: Low power model: <5uA; Normal: 10.38mA

XIAO nRF52840 Sense: Low power model: <5uA; Normal: 10.38mA

Power Consumption Verification

The Seeed Studio XIAO nRF52840 is low power consumption and here we provide a method to verify. It is highly recommended to use `the Seeed nRF52 Boards` library here. A step-by-Step tutorial is provided in our wiki.

4.1.4 Operating Voltage

XIAO nRF52840: Type C: 5V; Battery: 3.7V Li-ion

XIAO nRF52840 Sense: Type C: 5V; Battery: 3.7V Li-ion

4.1.5 Charging Current

XIAO nRF52840: 50mA ± 5mA

XIAO nRF52840 Sense: 50mA ± 5mA

4.1.6 Hardware and Software Feature

Hardware Additional Functionality

- NFC (Near Field Communication) Function (Antenna Required)
- 6-Axis IMU (for XIAO nRF52840 Sense)
- PDM Microphone (for XIAO nRF52840 Sense)

Software Features

- [Access the SWD Pins for Debugging and Reflashing Bootloader](#)
- [NFC Usage on Seeed Studio XIAO nRF52840 (Sense)](#)
- [The 6-Axis IMU Usage on Seeed Studio XIAO nRF52840 Sense](#)
- [The PDM Microphone Usage on Seeed Studio XIAO nRF52840 Sense](#)
- [Pin Multiplexing on Seeed Studio XIAO nRF52840 (Sense)](#)
- Bluetooth Usage (Seeed nRF52 Boards Library): Seeed Studio XIAO nRF52840 and Seeed Studio XIAO nRF52840 Sense both support Bluetooth connectivity.
  - a. [For Seeed nRF52 Boards Library](#)
  - b. [For Seeed nRF52 mbed-enabled Boards Boards](#)

4.1.7 Bootloader

- Standard Bootloader for common PC port identification
- UF2 Bootloader for CircuitPython usage of PC port identification

4.1.8 Programming Languages

XIAO nRF52840/Sense support Arduino, CircuitPython, and MicroPython.

- [Seeed Studio XIAO nRF52840/Sense with CircuitPython](#)
- [Getting Started with Seeed Studio XIAO nRF52840/Sense on Arduino IDE](#)
- [Seeed Studio XIAO nRF52840/Sense with MicroPython](#)

Note: it is not an official MicroPython support, we will update an official wiki in the future.

Two Arduino Libraries

Seeed Studio XIAO nRF52840 assembles many functions in one tiny board and sometimes may not perform the best of them. Hence, Seeed has published two Arduino libraries to let it maximize the power of each function. Therefore:

- It is recommended to use the `Seeed nRF52 Boards` library if you want to apply the **Bluetooth function** and "**Low Energy Cost Function**".
- It is recommended to use the `Seeed nRF52 mbed-enabled Boards` library if you want to use it in **embedded Machine Learning Applications** or apply "**IMU & PDM advanced function**".
- Both libraries support very well when comes to basic usages, such as **LED, Digital, Analog, Serial, I2C, and SPI**.

4.2 File Resources

4.2.1 PCBA

4.2.1.1 Footprint

[LBR] [Seeed Studio XIAO nRF52840 Eagle footprint](#)
[LBR] [Seeed Studio XIAO nRF52840 Sense Eagle footprint](#)

4.2.1.2 Schematic

[PDF] [Seeed Studio XIAO nRF52840 Schematic](#)
[PDF] [Seeed Studio XIAO nRF52840 Sense Schematic](#)

4.2.1.3 Dimension in DXF

[DXF] [Seeed Studio XIAO nRF52840 Dimension in DXF](#)
[DXF] [Seeed Studio XIAO nRF52840 Sense Dimension in DXF](#)

4.2.1.4 Pinout Sheet

[XLSX] [Seeed Studio XIAO nRF52840 pinout sheet](#)
[XLSX] [Seeed Studio XIAO nRF52840 Sense pinout sheet](#)

4.2.2 Certification

[ZIP] Seeed Studio XIAO nRF52840 Certification files

[ZIP] Seeed Studio XIAO nRF52840 Sense Certification files

This file includes CE, EU DoC, FCC, RoHS, TELEC, and UK DoC.

For Custom Clearance, you may need:

| HSCODE	8543709990
USHSCODE	8543709301
EUHSCODE	8543709099
COO	CHINA

5. Seeed Studio XIAO ESP32C3

5.1 Functional Introduction

5.1.1 Chip Datasheet

ESP32-C3 is a single-core Wi-Fi and Bluetooth 5 (LE) microcontroller SoC, based on the open-source RISC-V architecture. It strikes the right balance of power, I/O capabilities, and security, thus offering the optimal cost-effective solution for connected devices. The availability of Wi-Fi and Bluetooth 5 (LE) connectivity not only makes the device's configuration easy, but also facilitates a variety of use cases based on dual connectivity.

Download Datasheet

5.1.2 Pinout Reference
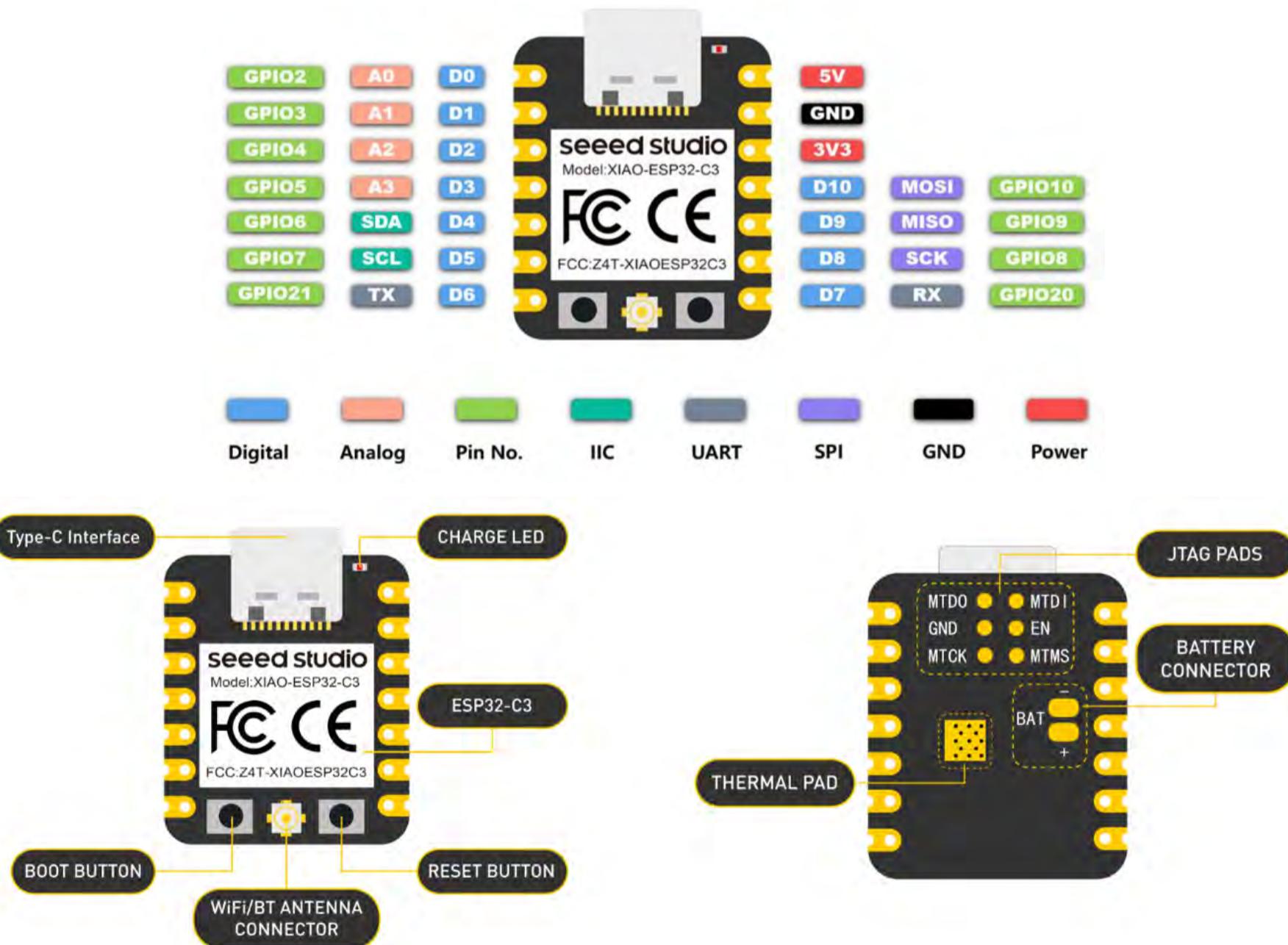
5.1.3 Power Consumption

Low power model: <44uA

Normal: 25.7mA

5.1.4 Operating Voltage

Type C: 5V
Battery: 3.7V Li-ion

5.1.5 Charging Current

380mA±30mA

5.1.6 Hardware and Software Feature

Hardware

Battery Charge Chip: ETA4054. The XIAO ESP32C3 is capable of using a 3.7V lithium battery as the power supply input. You can refer to the following diagram for the wiring method.
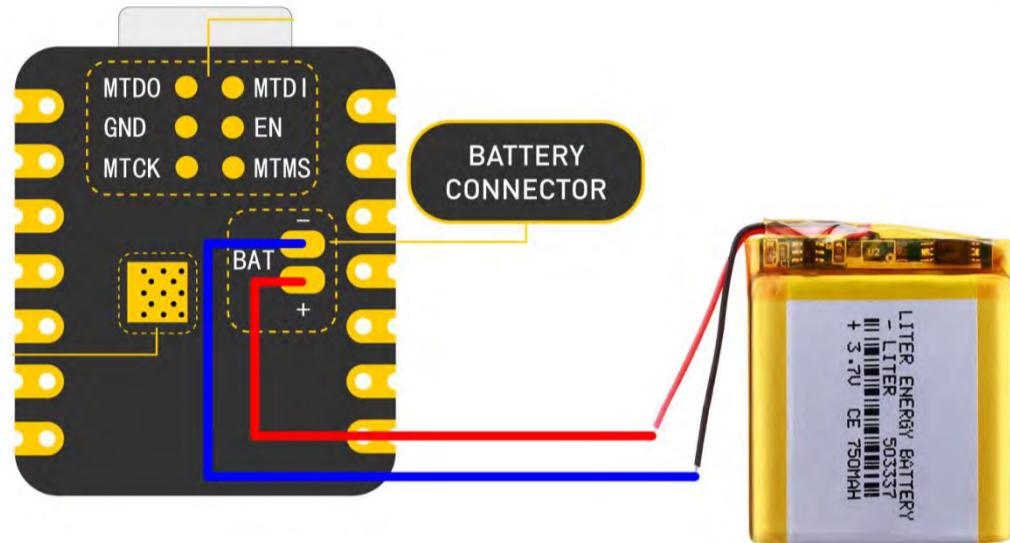
Attention: Please be careful not to short-circuit the positive and negative terminals and burn the battery and equipment when soldering.

Instructions on the use of batteries:

1. Please use qualified batteries that meet the specifications.

2. XIAO can be connected to your computer device via a data cable while using the battery, rest assured that XIAO has a built-in circuit protection chip, which is safe.

3. The XIAO ESP32C3 will not have any LED on when it is battery-powered (unless you have written a specific program), please do not judge whether the XIAO ESP32C3 is working or not by the condition of the LED, please judge it reasonably by your program.

Software Tutorial

- WiFi Usage on Seeed Studio XIAO ESP32C3
- Bluetooth Usage on Seeed Studio XIAO ESP32C3
- Pin Multiplexing on Seeed Studio XIAO ESP32C3

5.1.7 Bootloader

- Standard Bootloader for common PC port identification
- Enter Bootloader Method: Hold "BOOT" Buttion then connect to PC

You can simply connect the board to a PC via **USB Type-C** and reflash the bootloader with factory firmware by using **ESP RF Test Tool**. Step by step wiki is provided to guide you to reflash the bootloader with factory firmware.

5.1.8 Programming Languages

- Getting Started with Seeed Studio XIAO ESP32C3

5.2 File Resources

5.2.1 PCBA

5.2.1.1 Footprint

[LBR] Seeed Studio XIAO ESP32C3 Eagle footprint

5.2.1.2 Schematic

[PDF] Seeed Studio XIAO ESP32C3 Schematic

5.2.1.3 KiCAD Libraries

[ZIP] Seeed Studio XIAO ESP32C3 KiCAD Libraries

5.2.1.4 Eagle Libraries

[ZIP] Seeed Studio XIAO ESP32C3 Eagle Libraries

5.2.1.5 Dimension in DXF

[DXF] Seeed Studio XIAO ESP32C3 Dimension in DXF

5.2.1.6 Factory Firmware

[ZIP] Seeed Studio XIAO ESP32C3 Factory firmware

5.2.1.7 Pinout Sheet

[XLSX] Seeed Studio XIAO ESP32C3 pinout sheet

5.2.2 Structure

5.2.2.1 STL File

[ZIP] Seeed Studio XIAO ESP32C3 STL File

5.2.2.2 3D File

[STEP] Seeed Studio XIAO ESP32C3 3D Model

5.2.3 Certification

[ZIP] Seeed Studio XIAO ESP32C3 Certification files

This file includes CE, EU DoC, FCC, REACH, TELEC RoHS, and UK DoC.

For Custom Clearance, you can refer to：

HSCODE	8543709990
USHSCODE	8543709301
EUHSCODE	8543709099
COO	CHINA

6. Notification

## XIAO SAMD21 and XIAO RP2040
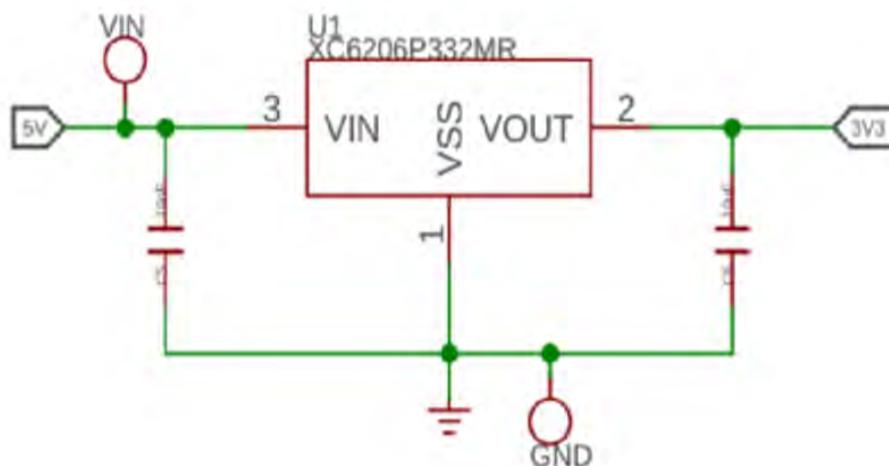
Fig. XIAO SAMD21
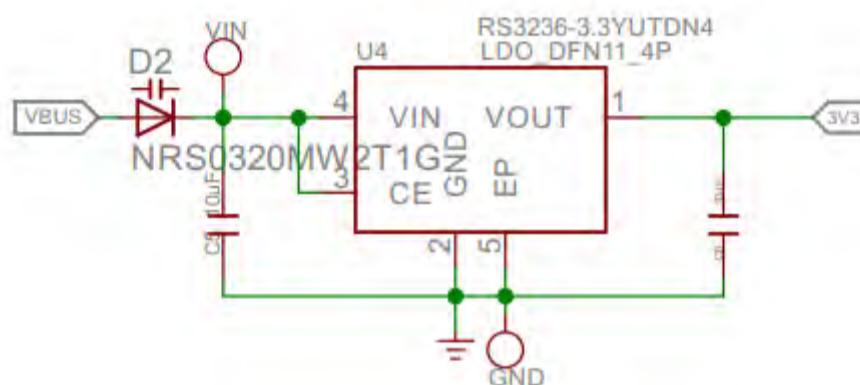
Fig. XIAO RP2040

Caution: For general I/O pins, the working voltage of MCU is 3.3V. Voltage input connected to general I/O pins may cause chip damage if it's higher than 3.3V. For power supply pins, the built-in DC-DC converter circuit able to change 5V voltage into 3.3V allows the power of the device with a 5V supply via VIN-PIN and 5V-PIN.

Interrupt

All pins on Seeed Studio XIAO SAMD21 support interrupts, but two pins cannot be used at the same time: 5 pin and 7 pins. For more detail about Interrupt please check here.

Pin Multuiplexing

We don't need to configure the pins ourselves, after using the pins, you can call a function directly. Detailed codes are provided within wiki page.

XIAO nRF52840/Sense

Q1: My Arduino IDE is stuck when uploading code to the board

You can first try to reset the board by clicking the "Reset Button" once. If that does not work, rapidly click it twice to enter bootloader mode. If that also doesn't work, disconnect the board from the PC, and connect the board again.

Q2: My board is not showing up as a serial device on Arduino IDE

You can first try to reset the board by clicking the "Reset Button" once. If that does not work, rapidly click it twice to enter bootloader mode.

The XIAO ESP32C3 does not support USB HID as the ESP32C3 does not support USB HID. But BLE HID is supported.

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7. PCBA Service

Committed to providing one-stop electronic hardware services for over a decade, Seeed Fusion has the expertise and engineering insight to deliver streamlined PCB assembly at low costs and is equipped with a wide range of value-added services and capabilities.

7.1 Turnkey PCB Assembly - Complete PCBA Quotation in Seconds

- One-stop PCB Manufacture, Parts Procurement, and Assembly
- Quality Guaranteed: Free DFA review and free functional testing for one piece
- Pre-Purchase Components and store them in Seeed's facilities until required
- Open Parts Library (OPL) - Locally available parts for faster and cheaper PCBA
- Mature supply chain management and global sourcing capabilities
- Over 10 SMT assembly lines and 12 years in-house expertise
- Free express shipping worldwide

Seeed Fusion Turnkey PCB Assembly Service Prototype to Mass Production

PCB Fabrication, components procurement and assembly, all-in-one from one simple platform.

Get a smart quote online now

Case Study: Gas/Smoke Detector, Alarm system with real-time leakage monitoring using Seeed Studio's XIAO RP2040.

## 7.2 OEM / ODM / and other design Services

- Rich R&D resources and product-to-market experience
- Proven expertise with custom Raspberry Pi, NVIDIA, STM-based designs, and more
- Integrated agile manufacturing and supply chain for fast product launches
- Over 1000+ successful product launches

What is the Seeed OEM Service?

Seeed provides complete Original Equipment Manufacturing services for a wide variety of electronic hardware, lifting your design from paper to production. Offering the entire package from PCB manufacture, parts procurement, turn-key assembly, mechanical parts manufacture, packaging services, and quality inspections down to shipping provisions, complete with dedicated account managers and expert engineers, Seeed can help you realize your ideas economically and efficiently.

What are the benefits of Seeed OEM service?

- In-House Supply Chain Team
- Reliable Production Line
- Strict Quality Control System
- Product Tracing System
- Reliability Testing
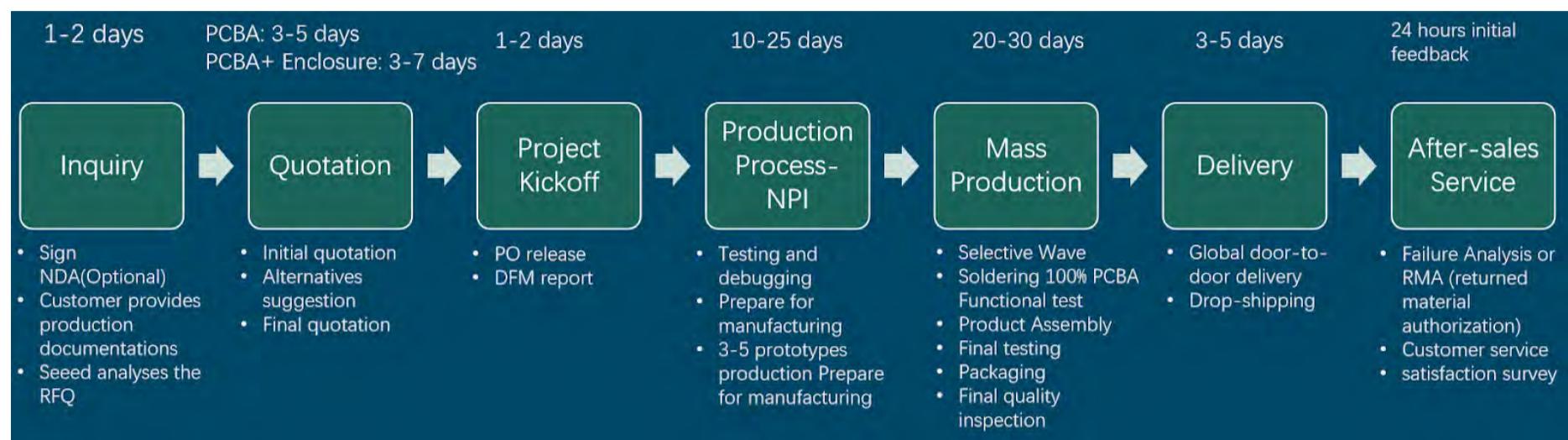
[Co-create with Seeed Fusion OEM to Realize Your Great Project Ideas Now!](#)

* Seeed OEM has a well-developed production process, testing, and delivery process.

7.3 Seeed Licensed Products Program

What is Licensed Products Program

Seeed licensing means that the licensor (cooperative partner) grants its own products (software or hardware), trademarks, brands, etc. to the licensee (Seeed) in the form of a contract. Seeed will assist with all electronics manufacturing including structural parts, testing, and certification, provide engineering and quality assurance services, and promotion, sales, and distribution around the world using Seeed's own network and channels. Seeed will ensure that your product is well looked after from start to finish.

[Co-invent with Seeed to launch your creation](#)

• PCBA Service Email: **fusion@seeed.io**   • Technical Support Email: **techsupport@seeed.io**   • Business Enquiry Email: **distribution@seeed.cc**

Success Stories with Seeed Licensed Products Program

Seeed assists with all electronics manufacturing including structural parts, testing, and certification, provides engineering and quality assurance services, and promotion, sales, and distribution around the world using Seeed's own network and channels to help these three keyboards go to market.

KLEIN | a wireless ergonomical keyboard
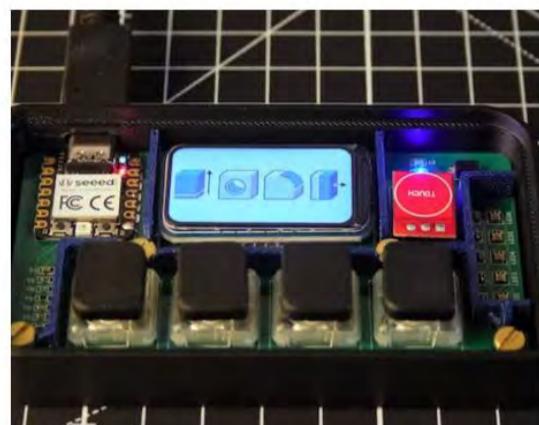
Shortcut Keyboard | a shortcut keyboard featuring 4 mechanical switches and a Display

MacroBoard | 9-key hotswap mechanical macropad

7.4 Seeed Studio XIAO Series Co-invent Campaign

7.4.1 POWER-UP PCBA #19: Speed up TinyML development with Seeed XIAO RP2040 and FREE Prototypes with Seeed Fusion

XIAO RP2040 opens up more powerful XIAO applications with direct support for MicroPython and CircuitPython. To support and inspire more XIAO RP2040 projects, Seeed Fusion is offering 2 free PCBA prototypes with the Seeed Fusion PCBA service. Don't let this amazing opportunity pass you by.

How to apply

Each person is limited to two PCBA boards 100% FREE for one design. The custom design must include Seeed XIAO RP2040. Please click the link and fill in the form: https://forms.gle/8dmLqtdXCiPvZ8Av9. Please be noted that when you are preparing the BOM file, just add the Seeed SKU 102010428 or the part number Seeed XIAO RP2040 to your BOM file. Add the order to the cart then contact our customer support (fusion@seeed.io) to obtain the corresponding cash coupon for settlement.

Case Study 1 – DIY 6-keys Macropad using Seeed XIAO RP2040 & Fusion PCBA

Case Study 2 – 8-keys KEM Keyboard Extender Maker project using Seeeduino XIAO & PCBA

Case Study 3 – 8-Keys Keyboard for Handwiring 'Le Pinceau' using Seeed XIAO BLE-nRF52840 & Fusion PCBA

Case Study 4 – Seeed Studio XIAO RP2040 18 Key Numpad

Case Study 5 – [Cistercian keyboard](#)

Case Study 6 – [Slice36 Minimalist Split Keyboard](#)

Case Study 7 – [First Hummingbird of the season](#)

Case Study 8 – [Custom-programmable, mini keyboards](#) with Seeed XIAO RP2040

([Know more Case details here](#))

7.4.2 POWER-UP PCBA #18: Open up new IoT possibilities with Seeed XIAO BLE for TinyML and Seeed Fusion PCBA service

In order to stimulate enthusiasm and help commercial customers land more productive and valuable landing projects. Seeed is sponsoring Seeed XIAO BLE -nRF52840 designs with the Seeed Fusion PCBA service. [Get one piece of your Prototype Seeed XIAO BLE design manufactured for free with Seeed Fusion PCBA Service.](#)

How to apply

All you need to do is fill in the form and complete your Seeed XIAO BLE design and each person is limited to two PCBA boards 100% FREE for one design. The custom design must include Seeed XIAO BLE -nRF52840 .

Please click the link and fill in the form: https://forms.gle/qKQhz7te5JDPPkdD8.

When preparing the BOM file, just add the Seeed SKU 102010448 or the part number Seeed XIAO BLE nRF52840 to your BOM file. Add the order to the cart then contact our customer support (fusion@seeed.io) to obtain the corresponding cash coupon for settlement.

8. Application

As introduced in the foreword, XIAO has been chosen and applied to many project prototypes, some of which have demonstrated its tremendous potential for addressing practical challenges. These projects have fallen under 5 main categories which has proven a huge success. If you are considering commercial prototypes related to these areas, the XIAO project collection can offer you a great deal of confidence and reassurance in your endeavors.

1. DIY XIAO Mechanical Keyboard
2. Unleash XIAO's Musical Potential: A Budget-Friendly Eurorack Solution, MIDI Keyboard Integration, and More!
3. Unleash the Power of Tracking with XIAO: The Unmissable Solution for Accurate, Reliable, and Affordable Tracking
4. XIAO in Healthcare: Solutions for Sun Damage, FoG Issues, Heartbeat Monitoring, and Blood Oxygen & Heart Rate Measurement
5. XIAO-Powered Detection Tools: Anomaly Detection & Motion Classification for Containers in Transit, AI-driven Yogurt Production, and Gas Leak Detection Robot

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