



XIAO



XIAO MG24



Getting Started with Seeed Studio XIAO MG24

Getting Started with Seeed Studio XIAO MG24



Getting Started with Seeed Studio XIAO MG24(Sense)

Seeed Studio XIAO MG24

Seeed Studio XIAO MG24 Sense

[Get One Now !\[\]\(3dfb8d66e81160ad61421a3452093d1b_img.jpg\)](#)[Get One Now !\[\]\(99f58673407353e96a019fbca558fd72_img.jpg\)](#)

Introduction

Seeed Studio XIAO MG24 is a mini development board based on Silicon Labs' MG24. XIAO MG24 is based on **ARM Cortex-M33 core, 32-bit RISC** architecture with a maximum clock speed of 78MHz, supporting DSP instructions and FPU floating-point operations, possessing powerful computing power, and built-in **AL/ML hardware accelerator MVP**, which can efficiently process AI/machine learning algorithms. Secondly, it has excellent RF performance, It supports multiple IoT and wireless transmission protocols such as **Matter, Thread, Zigbee, Bluetooth LE 5.3, Bluetooth mesh** etc.

Specification

Item	Seeed Studio XIAO MG24	Seeed Studio XIAO MG24 Sense
Processor	Silicon Labs EFR32MG24 ARM Cortex-M33 @ 78MHz	
Wireless	Complete 2.4GHz Wi-Fi subsystem BLE: Bluetooth 5.3, Bluetooth mesh	
Built-in Sensors	-	6-Axis IMU(LSM6DS3TR-C) Analog Microphone(MSM381ACT001)

Memory	256kB RAM & 1538KB + 4MB Flash	256kB RAM & 1538KB + 4MB Flash
Interface	2x UART, 1x IIC, 2x SPI, 18x Analog, 18x Digital, ALL PWM, 1x User LED, 1x Charge LED 1x Reset button,	2x UART, 1x IIC, 2x SPI, 18x Analog, 18x Digital, ALL PWM, 1x User LED, 1x Charge LED 1x Reset button,
Dimensions	21 x 17.8mm	21 x 17.8mm
Power	Input voltage (Type-C): 5V@14mA Input voltage (BAT): 3.7V@7mA	
	Charging battery current: 200mA	Charging battery current: 200mA
Low Power Consumption Model	Normal: 3.7V/6.71 mA Sleep Model: 3.7V/1.91mA Deep Sleep Model: 3.7V/1.95μA	Normal: 3.7V/6.71 mA Sleep Model: 3.7V/1.91mA Deep Sleep Model: 3.7V/1.95μA
Working Temperature	-20°C ~ 70°C	

Features

- **Powerful CPU:**ARM Cortex-M33 core, with a maximum clock speed of 78MHz, supporting DSP instructions and FPU floating-point operations, 32-bit RISC architecture.
- **Ultra-Low Power:**RX current 4.6mA/TX current 5mA (0dBm), multiple low-power sleep modes
- **Powerful AI:**Built in AI/ML hardware accelerator MVP, capable of efficiently processing AI/machine learning algorithms.
- **Multi style wireless transmission:**Integrated 2.4GHz multi protocol wireless transceiver, supporting multiple IoT protocols such as Matter, OpenThread, Zigbee,

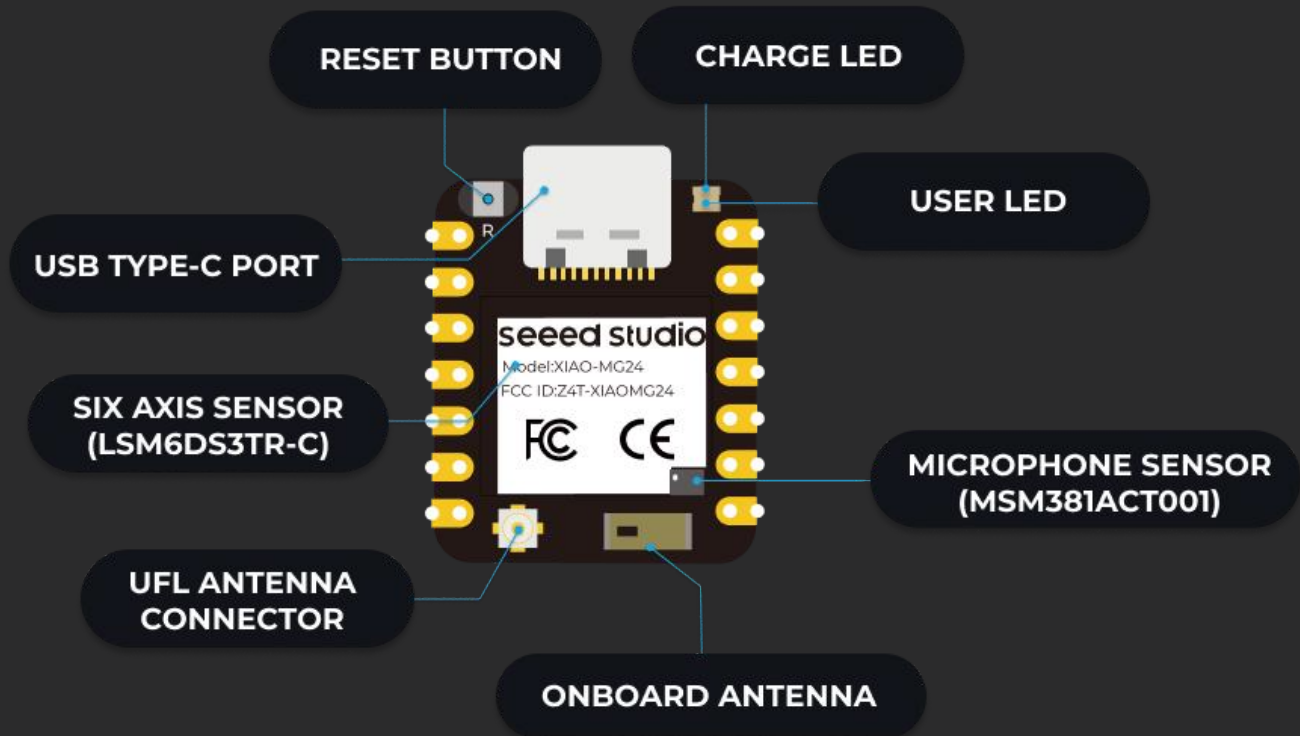
Bluetooth LE 5.3, Bluetooth mesh, etc.

- **Powerful security:** Powerful security features of Secure Vault, including secure boot, encryption, random number generation, tamper proof, secure debugging, etc.
- **Ultra-small size:**
- **Rich on-chip resources:** Maximum 1536KB Flash and 256KB RAM, with ample storage space.
- **Rich interfaces:** Integrated with 12 bit 1Msps ADC, temperature sensor, analog comparator, DCDC and other rich peripherals, and up to 22 Pin, 2 USART, 2 low-power UART, 1 IIC and other interfaces.

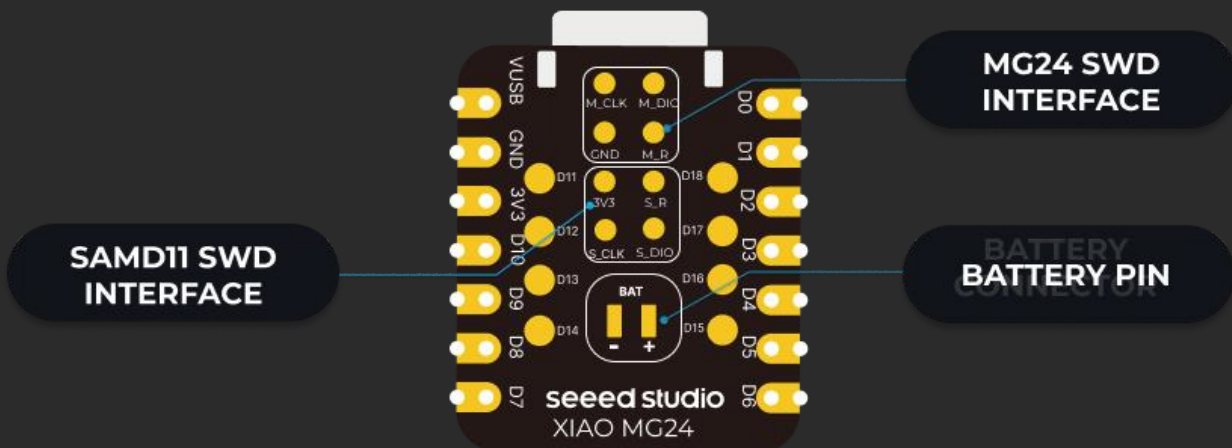
Hardware overview

XIAO MG24 Sense indication diagram

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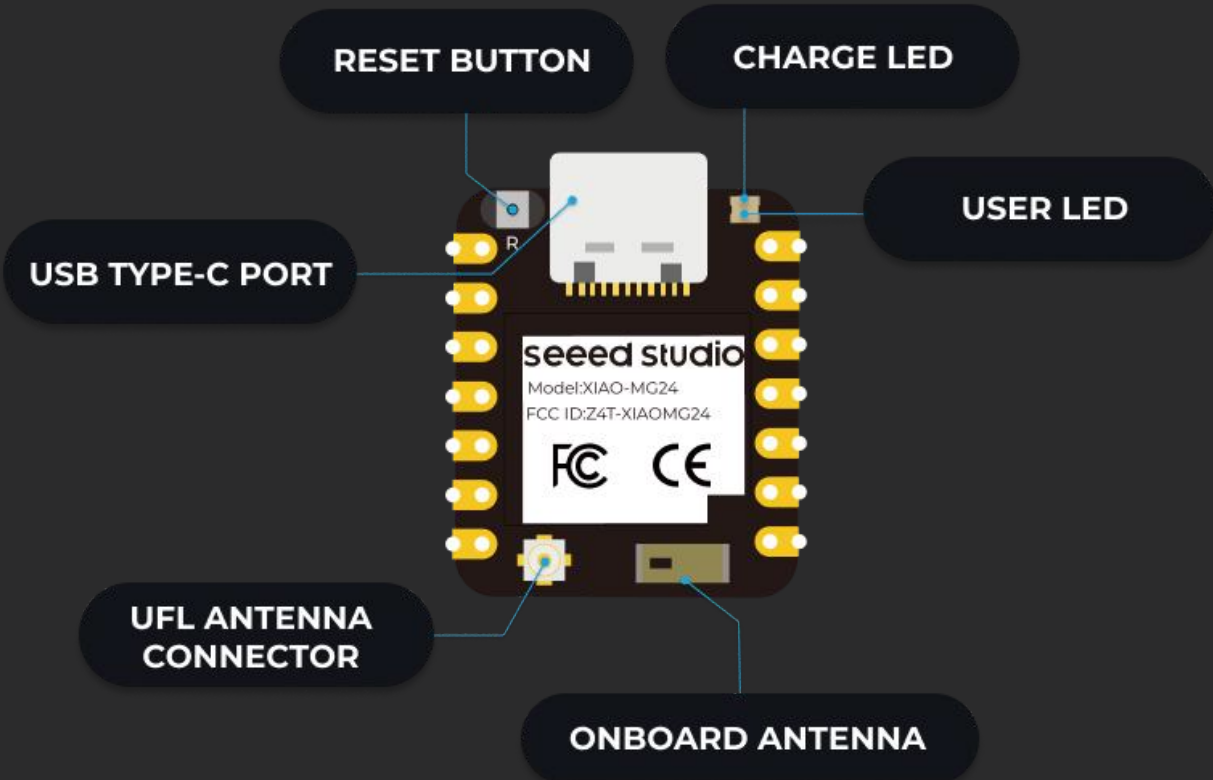


Back

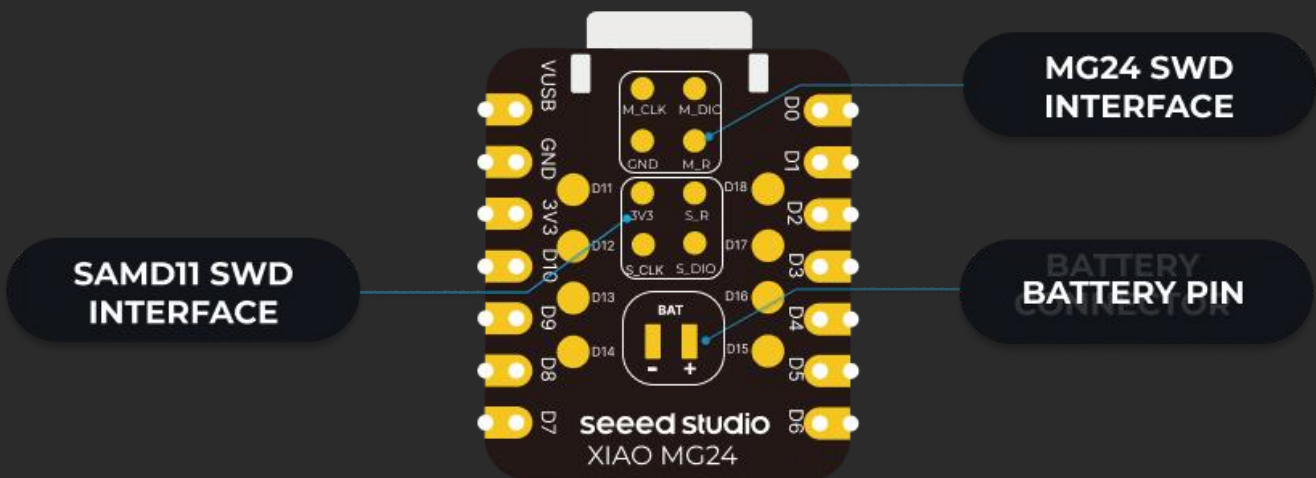


XIAO MG24 indication diagram

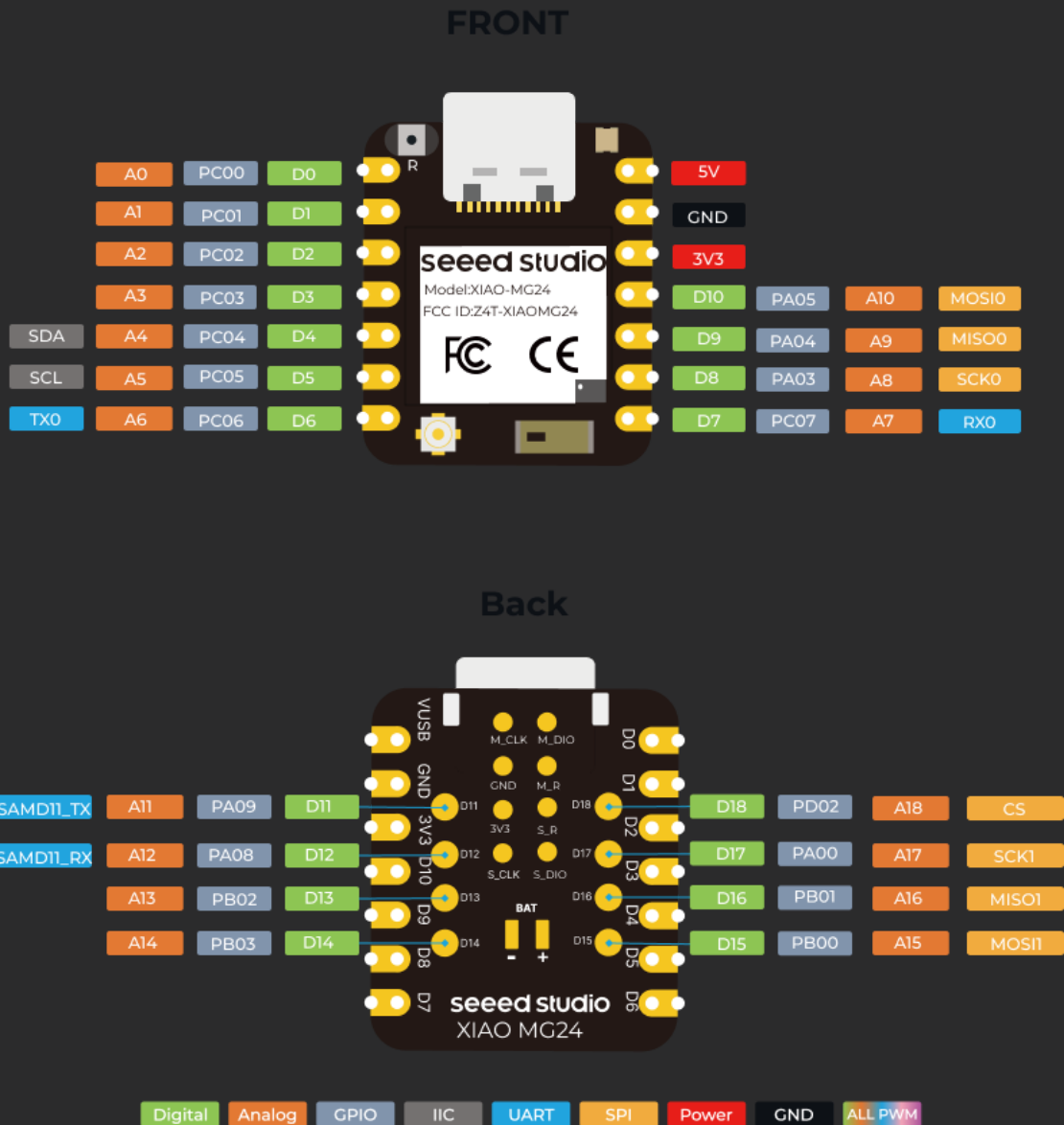
FRONT



Back



XIAO MG24/ XIAO MG24(Sense) Pin List



TIP

The difference between the two development boards is that MG24 Sense has a microphone sensor and a six axis acceleration sensor, while MG24 does not have one.

- 5V - This is 5v out from the USB port. You can also use this as a voltage input but you must have some sort of diode (schottky, signal, power) between your external power source and this pin with anode to battery, cathode to 5V pin.
- 3V3 - This is the regulated output from the onboard regulator.
- GND - Power/data/signal ground

Getting started

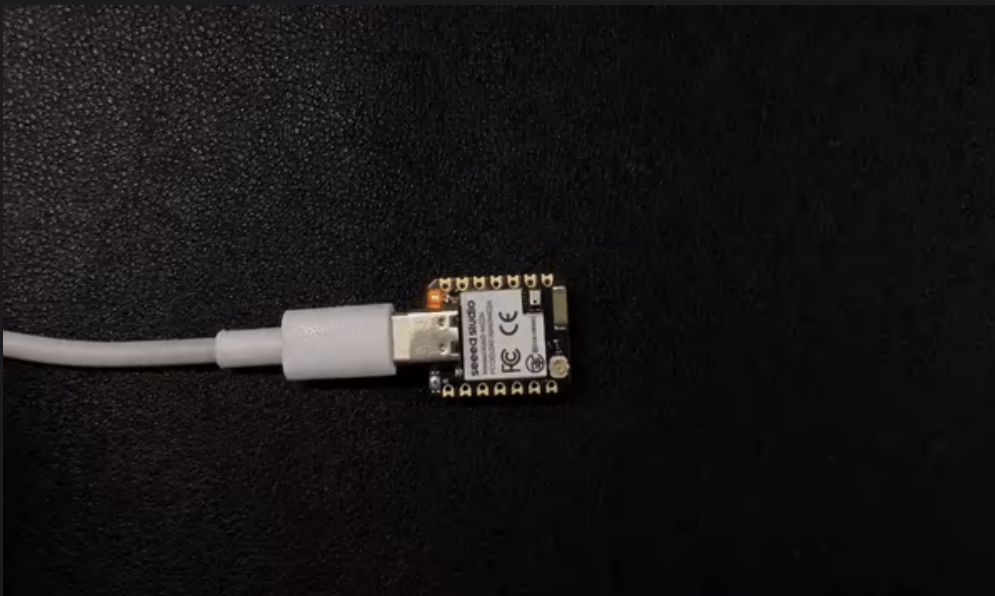
To enable you to get started with the XIAO MG24 faster, please read the hardware and software preparation below to prepare the XIAO.

Factory procedure

We pre-program each new XIAO MG24 and XIAO MG24 Sense with a simple factory program.

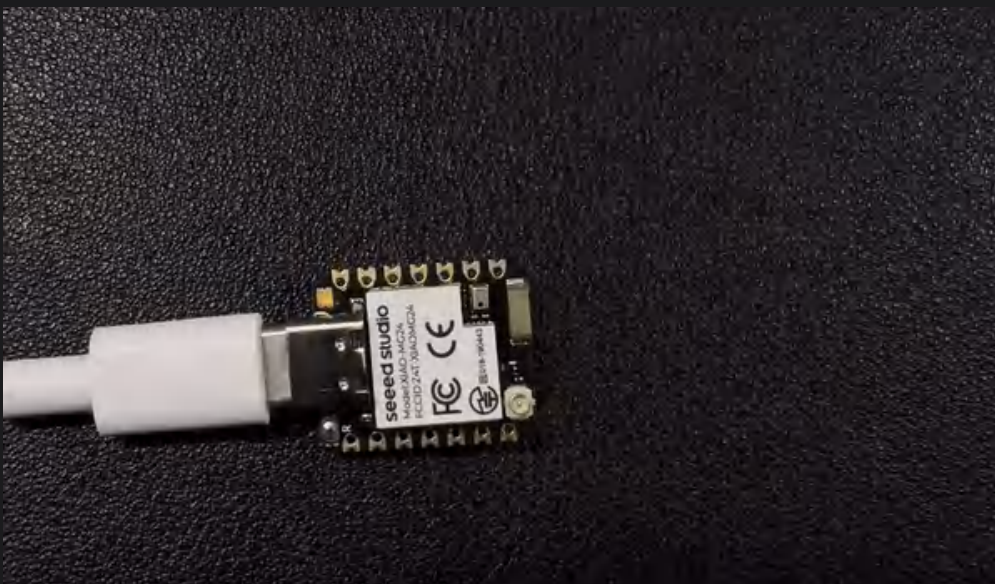
1. XIAO MG24

The factory program preset in the regular version is Blink Light. When you power up the XIAO, the orange user indicator will light up.



2. XIAO MG24 Sense

The factory program preset in the regular version is The louder you shout, the brighter the light will be.



Hardware Preparation

You need to prepare the following:

- 1 x [Seeed Studio XIAO MG24](#)
- 1 x Computer
- 1 x USB Type-C cable



TIP

Some USB cables can only supply power and cannot transfer data. If you don't have a USB cable or don't know if your USB cable can transmit data, you can check [Seeed USB Type-C support USB 3.1](#).

Software Preparation

The recommended programming tool for the XIAO MG24 is the Arduino IDE, so you need to complete the Arduino installation as part of the software preparation.



TIP

If this is your first time using Arduino, we highly recommend you to refer to [Getting Started with Arduino](#).

- **Step 1.** Download and Install the stable version of Arduino IDE according to your operating system.

[Download Arduino IDE](#)

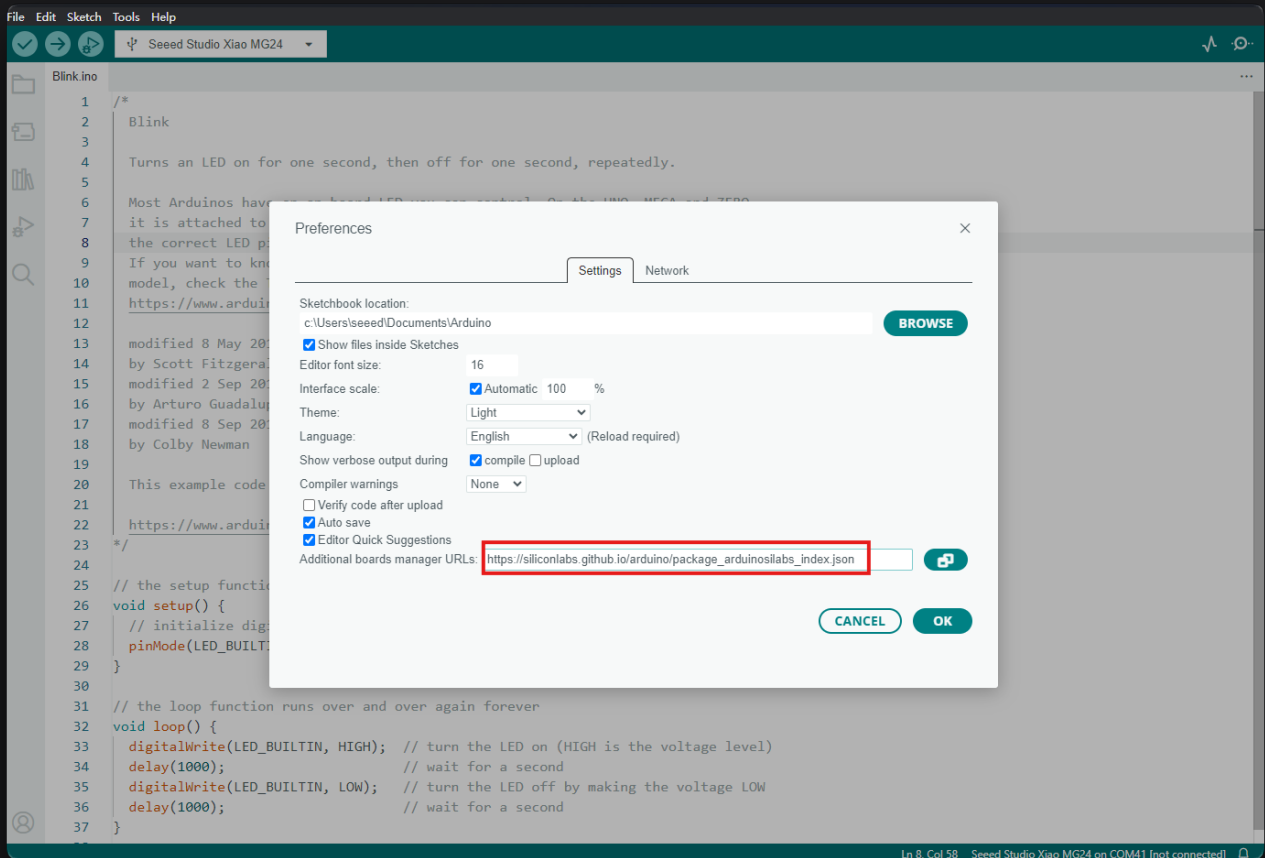
- **Step 2.** Launch the Arduino application.
- **Step 3.** Add the XIAO MG24 on-board package to the Arduino IDE and click **OK**.
- **Step 4.** Close the Arduino IDE and reopen it.

Add the XIAO MG24 Board

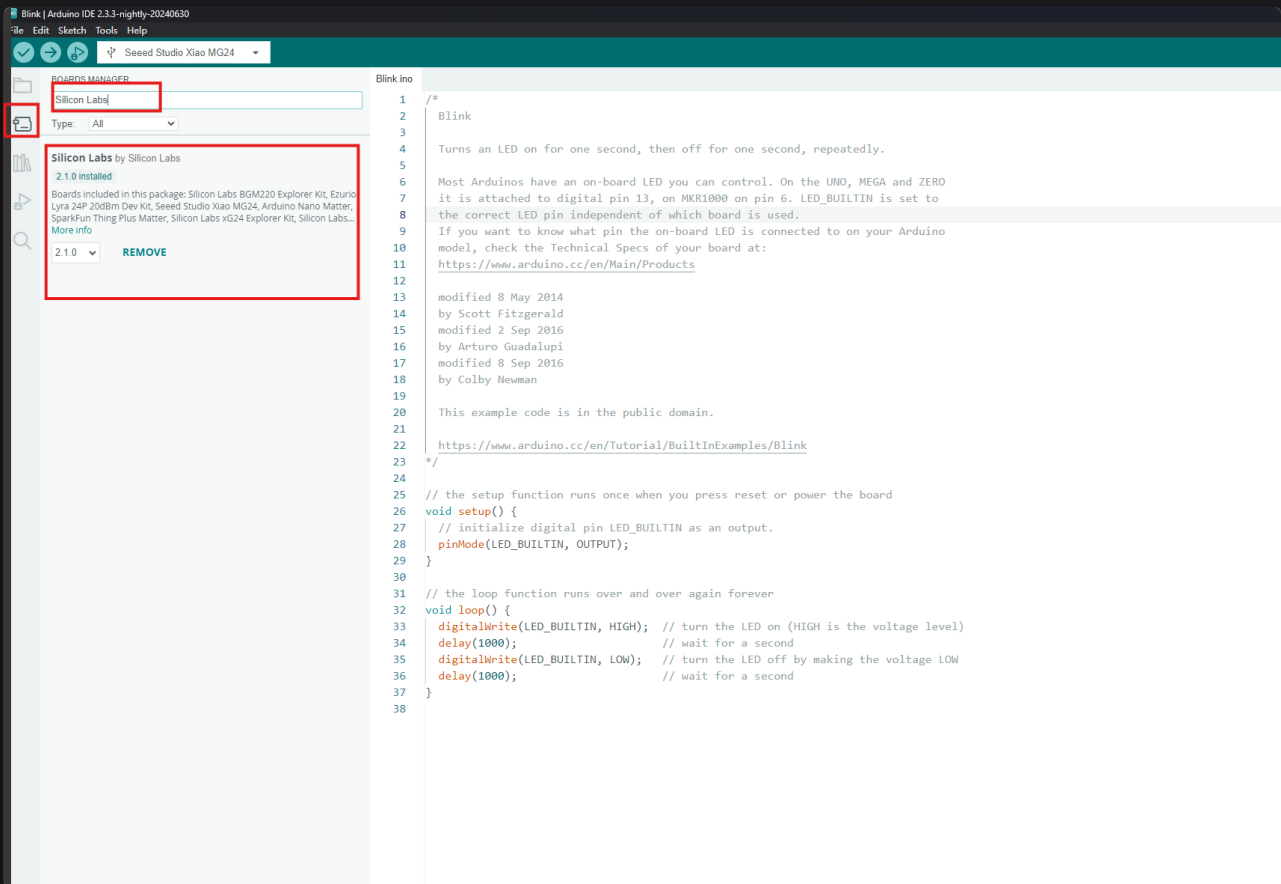
To install the XIAO MG24 board, follow these steps:

```
https://siliconlabs.github.io/arduino/package_arduinossilabs_index.json
```

1. Add the above board manager URL to the preferences of your Arduino IDE.



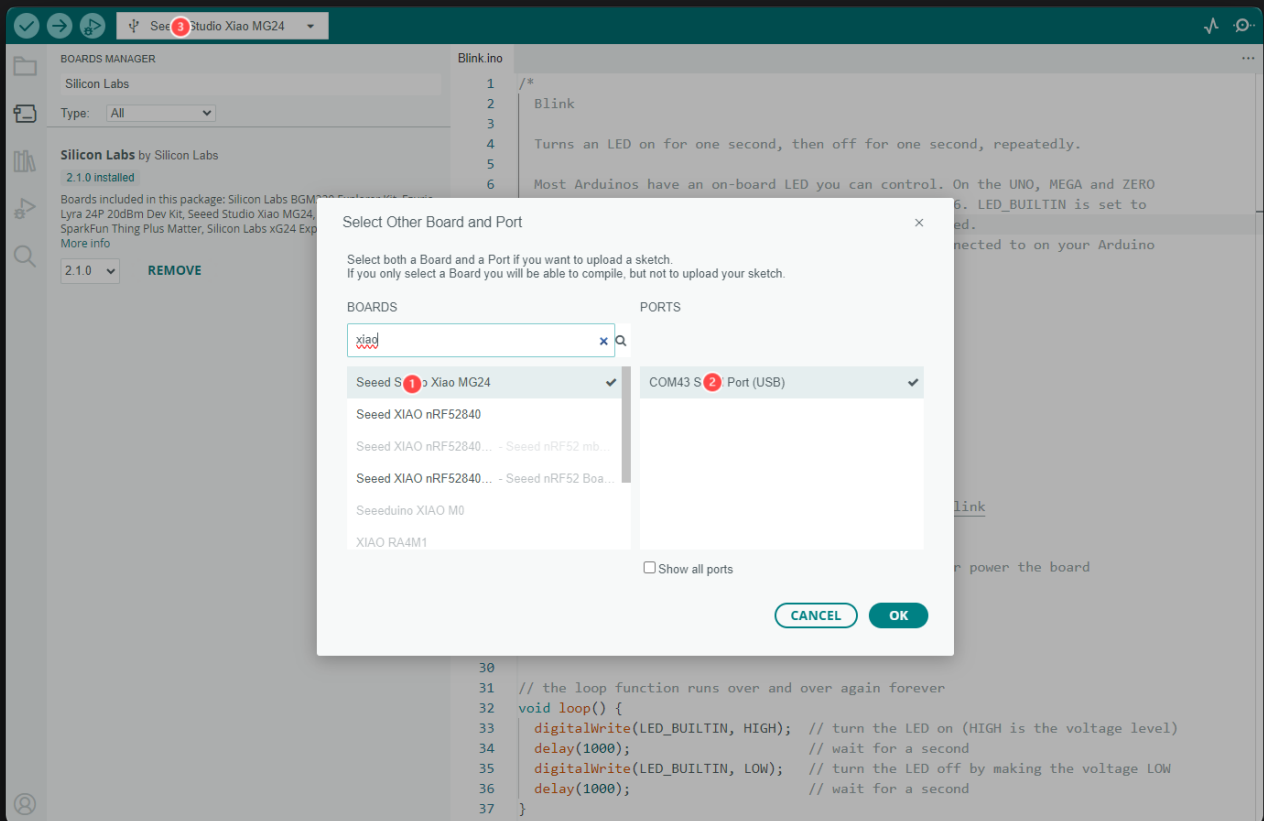
2. Download the XIAO MG24 board package.



TIP

If you cannot find it after entering, please reopen the Arduino IDE.

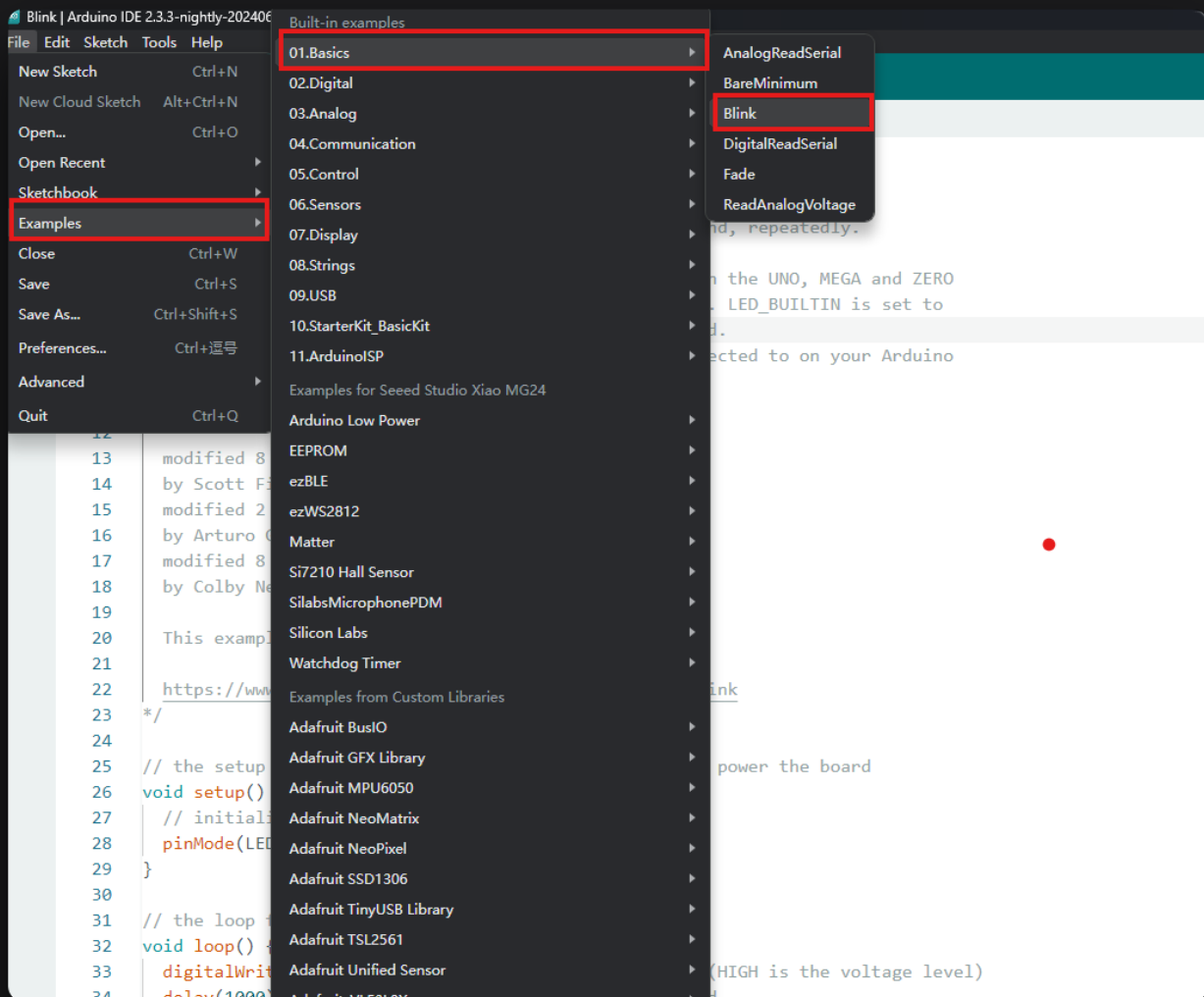
3. Opt for `XIAO_MG24` variant.



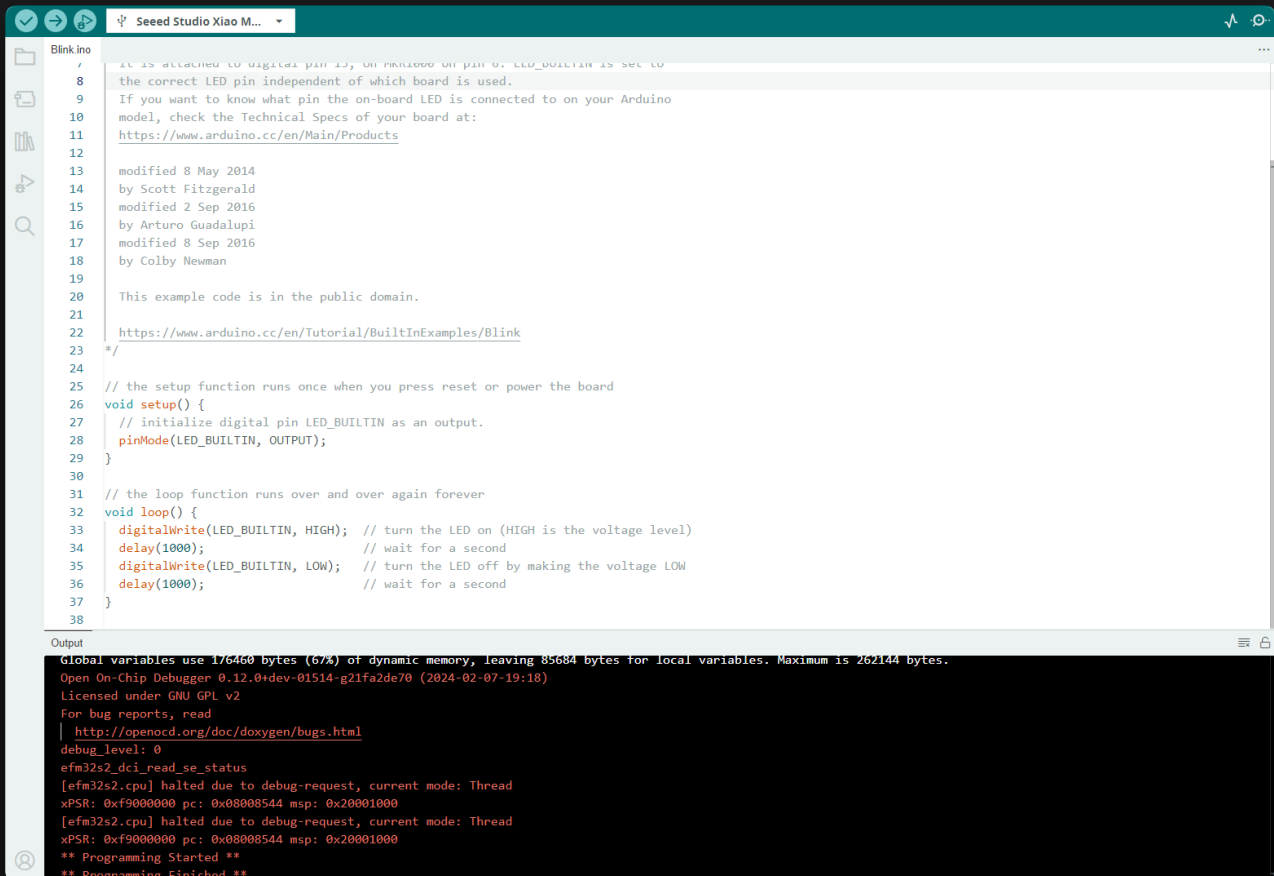
Now enjoy coding ✨.

Run your first Blink program

- **Step 1.** Launch the Arduino application.
- **Step 2.** Navigate to **File > Examples > 01.Basics > Blink**, open the program.



- **Step 3.** Select the board model to **XIAO MG24**, and select the correct port number to upload the program.



The screenshot shows the Seeded Studio IDE with the 'Blink.ino' file open. The code is a standard Arduino Blink sketch that toggles the built-in LED on and off every second. The output window at the bottom shows the compilation and upload process, including memory usage, Open On-Chip Debugger status, and the final 'Programming Finished' message.

```
8 // it is attached to digital pin 13, on M0 Pro or M0 Pro mini. LED_BUILTIN is set to
9 // the correct LED pin independent of which board is used.
10 // If you want to know what pin the on-board LED is connected to on your Arduino
11 // model, check the Technical Specs of your board at:
12 // https://www.arduino.cc/en/Main/Products
13 //
14 // modified 8 May 2014
15 // by Scott Fitzgerald
16 // modified 2 Sep 2016
17 // by Arturo Guadalupi
18 // modified 8 Sep 2016
19 // by Colby Newman
20 //
21 // This example code is in the public domain.
22 // https://www.arduino.cc/en/Tutorial/BuiltInExamples/Blink
23 //
24 //
25 // the setup function runs once when you press reset or power the board
26 void setup() {
27   // initialize digital pin LED_BUILTIN as an output.
28   pinMode(LED_BUILTIN, OUTPUT);
29 }
30 //
31 // the loop function runs over and over again forever
32 void loop() {
33   digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
34   delay(1000); // wait for a second
35   digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
36   delay(1000); // wait for a second
37 }
38
```

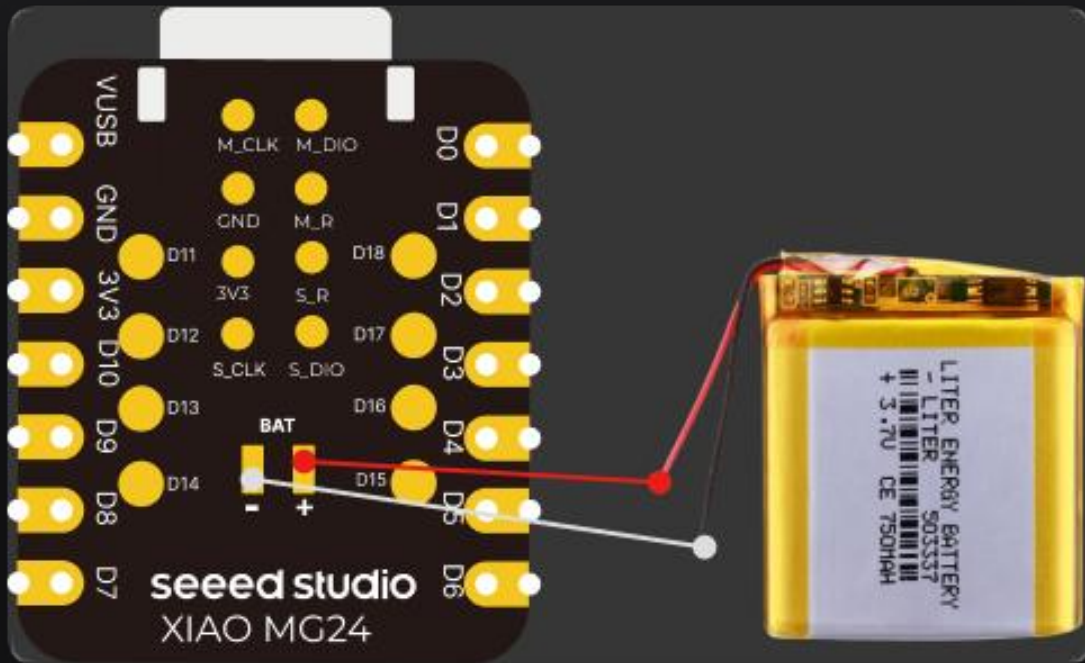
Output

```
Global variables use 17640 bytes (67%) of dynamic memory, leaving 85684 bytes for local variables. Maximum is 262144 bytes.
Open On-Chip Debugger 0.12.0+dev-01514-g21fa2de70 (2024-02-07-19:18)
Licensed under GNU GPL v2
For bug reports, read
| http://openocd.org/doc/doxygen/bugs.html
debug_level: 0
efm32s2_dci_read_se_status
[efm32s2.cpu] halted due to debug-request, current mode: Thread
xPSR: 0xf9000000 pc: 0x08008544 msp: 0x20001000
[efm32s2.cpu] halted due to debug-request, current mode: Thread
xPSR: 0xf9000000 pc: 0x08008544 msp: 0x20001000
** Programming Started **
** Programming Finished **
```

Once the program is successfully uploaded, you will see the following output message and you can observe that the orange LED on the right side of the XIAO MG24 is blinking.

MG24 BLink Code	LED BLink Display
-----------------	-------------------


```
1  /*
2  3  4  Turns an LED on for one second, then off for one second, repeatedly.
5
6  Most Arduinos have an on-board LED you can control. On the UNO, MEGA and ZERO
7  it is attached to digital pin 13, on PRO1000 to pin 6. LED_BUILTIN is set to
8  the correct LED pin independent of which board is used.
9  If you want to know what pin the on-board LED is connected to on your Arduino
10 model, check the Technical Specs of your board at:
11 https://www.arduino.cc/en/Main/Products
12
13 modified 8 May 2014
14 by Scott Fitzgerald
15 modified 2 Sep 2016
16 by Arturo Guadalupi
17 modified 8 Sep 2016
18 by Colby Neuman
19
20 This example code is in the public domain.
21
22 https://www.arduino.cc/en/Tutorial/BuiltInExamples/Blink
23 */
24
25 // the setup function runs once when you press reset or power the board
26 void setup() {
27   // initialize digital pin LED_BUILTIN as an output.
28   pinMode(LED_BUILTIN, OUTPUT);
29 }
30
31 // the loop function runs over and over again forever
32 void loop() {
33   digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
34   delay(1000); // wait for a second
35   digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
36   delay(1000); // wait for a second
37 }
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```



⚠ CAUTION

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 data cable while using the battery, rest assured that XIAO has a built-in circuit protection chip, which is safe.
3. The XIAO MG24 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 MG24 is working or not by the condition of the LED, please judge it reasonably by your program.
4. Sorry, we currently have no way to help you check the remaining battery level through software (because there are no more chip pins available), you need to charge the battery regularly or use a multimeter to check the battery level.

Test voltage

Software code

```
/*
  AnalogReadSerial

  Reads an analog input on pin 0, prints the result to the Serial Monitor.
  Graphical representation is available using Serial Plotter (Tools > Serial
  Plotter menu).

  Attach the center pin of a potentiometer to pin A0, and the outside pins to
  +5V and ground.

  This example code is in the public domain.

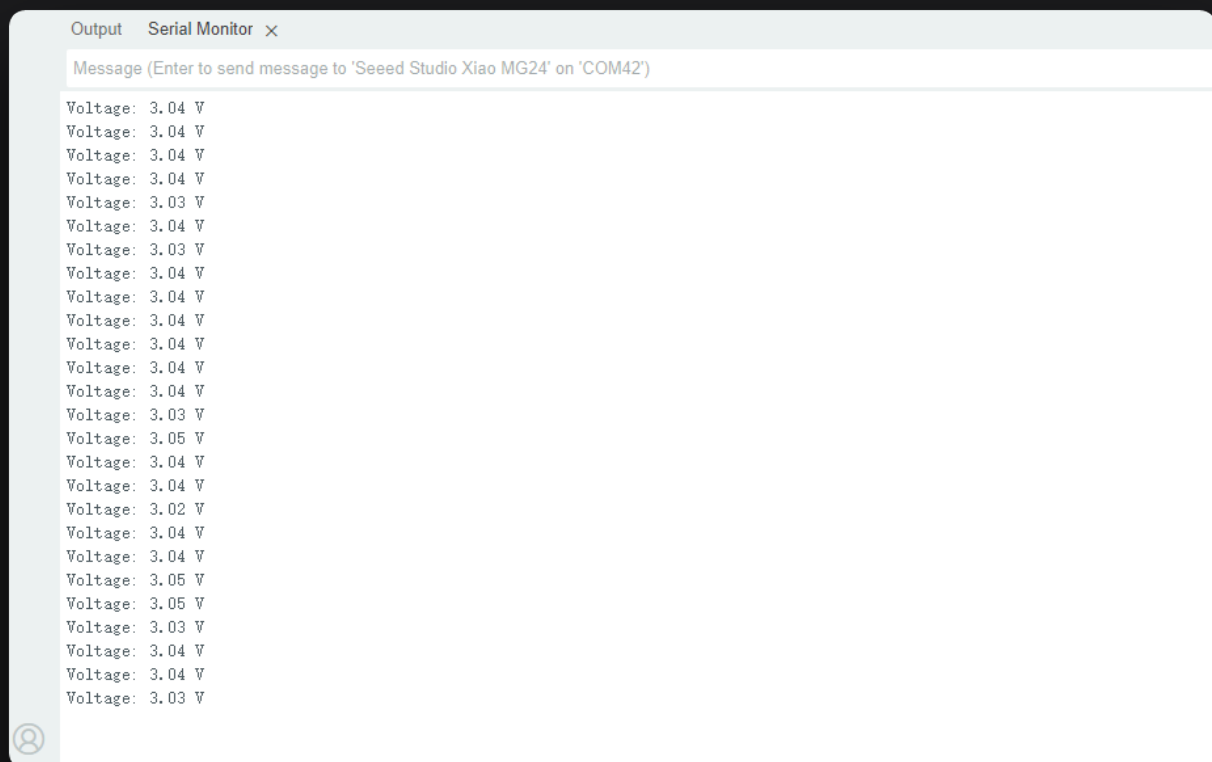
  https://www.arduino.cc/en/Tutorial/BuiltInExamples/AnalogReadSerial
*/

// the setup routine runs once when you press reset:
void setup() {
  Serial.begin(115200);
  pinMode(PD3, OUTPUT);
  digitalWrite(PD3, HIGH);
}

void loop() {
  int voltageValue = analogRead(PD4);
  float voltage = voltageValue * (5.0 / 4095.0);

  Serial.print("Voltage: ");
  Serial.print(voltage, 2);
  Serial.println(" V");
  delay(1000); // delay in between reads for stability
}
```

Display Result



Deep Sleep and Sleep Example

Demo1 : Sleep Mode and wake-up

```
/*
```

```
  ArduinoLowPower timed sleep example
```

The example shows the basic usage of the Arduino Low Power library by putting the device to sleep for a period of time.

The device will enter sleep mode for 2000ms. During sleep the CPU is stopped but the RAM retains its contents.

This example is compatible with all Silicon Labs Arduino boards.

Author: Tamas Jozsi (Silicon Labs)

```
*/
```

```
#include "ArduinoLowPower.h"
```

```
void setup()
```

```

{
  Serial.begin(115200);
  pinMode(LED_BUILTIN, OUTPUT);
  digitalWrite(LED_BUILTIN, LED_BUILTIN_INACTIVE);
  Serial.println("Sleep with timed wakeup");
}

void loop()
{
  digitalWrite(LED_BUILTIN, LED_BUILTIN_ACTIVE);
  delay(500);
  digitalWrite(LED_BUILTIN, LED_BUILTIN_INACTIVE);
  delay(500);

  Serial.printf("Going to sleep at %lu\n", millis());
  LowPower.sleep(2000);
  Serial.printf("Woke up at %lu\n", millis());
}

```

Demo2 : Deep Sleep Mode and wake-up

```

/*
  ArduinoLowPower deep sleep example with external or timed wakeup

  The example shows the basic usage of the Arduino Low Power library by
  putting the device into deep sleep.
  The device will remain in deep sleep until the sleep timer expires.
  During deep sleep the whole device is powered down except for a minimal set
  of peripherals (like the Back-up RAM and RTC).
  This means that the CPU is stopped and the RAM contents are lost - the
  device will start from the beginning of the sketch after waking up.

  This example is compatible with all Silicon Labs Arduino boards.

  Author: Tamas Jozsi (Silicon Labs)
*/

#include "ArduinoLowPower.h"

void setup()
{
  Serial.begin(115200);
  pinMode(LED_BUILTIN, OUTPUT);
  digitalWrite(LED_BUILTIN, LED_BUILTIN_INACTIVE);
  Serial.println("Deep sleep timed wakeup");
}

```

```

void loop()
{
    digitalWrite(LED_BUILTIN, LED_BUILTIN_ACTIVE);
    delay(500);
    digitalWrite(LED_BUILTIN, LED_BUILTIN_INACTIVE);
    delay(500);

    Serial.printf("Going to deep sleep for 10s at %lu\n", millis());
    LowPower.deepSleep(10000);
}

```

Demo3 : Deep Sleep Mode with flash and wake-up



TIP

If you want to set flash to deep sleep, you need to enable the 0xb9 register

```

/*
    ArduinoLowPower deep sleep example with external or timed wakeup

    The example shows the basic usage of the Arduino Low Power library by
    putting the device into deep sleep.

    The device will remain in deep sleep until the sleep timer expires.
    During deep sleep the whole device is powered down except for a minimal set
    of peripherals (like the Back-up RAM and RTC).

    This means that the CPU is stopped and the RAM contents are lost - the
    device will start from the beginning of the sketch after waking up.

    This example is compatible with all Silicon Labs Arduino boards.

    Author: Tamas Jozsi (Silicon Labs)
*/
#include <Arduino.h>
#include "ArduinoLowPower.h"

#define CS_PIN PA6
#define CLK_PIN PA3
#define MOSI_PIN PA5
#define MISO_PIN PA4

#define READ_DATA 0x03

```



```

#define WRITE_ENABLE 0x06
#define PAGE_PROGRAM 0x02
#define SECTOR_ERASE 0x20

void sendSPI(byte data) {
    for (int i = 0; i < 8; i++) {
        digitalWrite(MOSI_PIN, data & 0x80);
        data <<= 1;
        digitalWrite(CLK_PIN, HIGH);
        delayMicroseconds(1);
        digitalWrite(CLK_PIN, LOW);
        delayMicroseconds(1);
    }
}

void writeEnable() {
    digitalWrite(CS_PIN, LOW);
    sendSPI(WRITE_ENABLE);
    digitalWrite(CS_PIN, HIGH);
}

void setup()
{
    //Serial.begin(115200);
    pinMode(PA7, OUTPUT);
    digitalWrite(PA7, LOW);

    pinMode(CS_PIN, OUTPUT);
    pinMode(CLK_PIN, OUTPUT);
    pinMode(MOSI_PIN, OUTPUT);
    pinMode(MISO_PIN, INPUT);

    //SW
    pinMode(PD3, OUTPUT);
    pinMode(PB5, OUTPUT);
    pinMode(PB1, OUTPUT);
    pinMode(PB0, OUTPUT);
    pinMode(PA6, OUTPUT);
    digitalWrite(PD3, LOW); //VBAT
    digitalWrite(PB5, LOW); //RF_SW
    digitalWrite(PB1, LOW); //IMU
    digitalWrite(PB0, LOW); //MIC
    digitalWrite(PA6, HIGH); //FLASH

    //Serial.println("Deep sleep timed wakeup");
    writeEnable();
}

```

```

digitalWrite(CS_PIN, LOW);
sendSPI(0xB9);
digitalWrite(CS_PIN, HIGH);
}

void loop()
{
    delay(12000);
    digitalWrite(PA7, HIGH);
    delay(500);

    //Serial.printf("Going to deep sleep for 10s at %lu\n", millis());
    LowPower.deepSleep(600000);
}

```



Resources

For Seeed Studio XIAO MG24 Sense

- [PDF] [Seeed Studio XIAO MG24 Sense datasheet](#)
- [PDF] [Seeed Studio XIAO MG24 Sense Schematic](#)

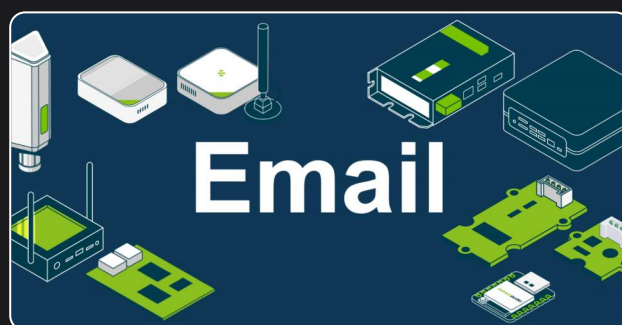
- 📄 [PDF] [Seeed Studio XIAO MG24 Sense Wireless SoC](#)
- 🔗 [Kicad] [Seeed Studio XIAO MG24 Sense FootPrint](#)


For Seeed Studio XIAO MG24

- 📄 [PDF] [Seeed Studio XIAO MG24 datasheet](#)
- 📄 [PDF] [Seeed Studio XIAO MG24 Schematic](#)
- 📄 [PDF] [Seeed Studio XIAO MG24 Wireless SoC](#)
- 🔗 [Kicad] [Seeed Studio XIAO MG24 FootPrint](#)

Tech Support & Product Discussion

Thank you for choosing our products! We are here to provide you with different support to ensure that your experience with our products is as smooth as possible. We offer several communication channels to cater to different preferences and needs.



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Last updated on **Oct 17, 2024** by *Jason*

FCC Requirement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

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Introduction

Seeed Studio XIAO MG24 is a mini development board based on Silicon Labs' MG24. XIAO MG24 is based on **ARM Cortex-M33 core, 32-bit RISC** architecture with a maximum clock speed of 78MHz, supporting DSP instructions and FPU floating-point operations, possessing powerful computing power, and built-in **AL/ML hardware accelerator MVP**, which can efficiently process AI/machine learning algorithms. Secondly, it has excellent RF performance, It supports multiple IoT and wireless transmission protocols such as **Matter, Thread, Zigbee, Bluetooth LE 5.3, Bluetooth mesh** etc.

Specification

Item	Seeed Studio XIAO MG24	Seeed Studio XIAO MG24 Sense
Processor	Silicon Labs EFR32MG24 ARM Cortex-M33 @ 78MHz	
Wireless	Complete 2.4GHz Wi-Fi subsystem BLE: Bluetooth 5.3, Bluetooth mesh	
Built-in Sensors	-	6-Axis IMU(LSM6DS3TR-C) Analog Microphone(MSM381ACT001)