

Chapter 220

Online Content: Microcontrollers I

220.1 Alternatives to the SparkFun SAMD21 Mini

220.1.1 The WeMos SAMD21 M0-Mini

This is an alternative to the SparkFun SAMD21 Mini Breakout that has the difficult-to-solder 0.05 inch Cortex Debug port header preinstalled.¹ While it is almost electrically identical to the SparkFun board, it is not mechanically the same. It is larger, includes four extra I/O pins and the pins are in a different position than on the smaller SparkFun board.

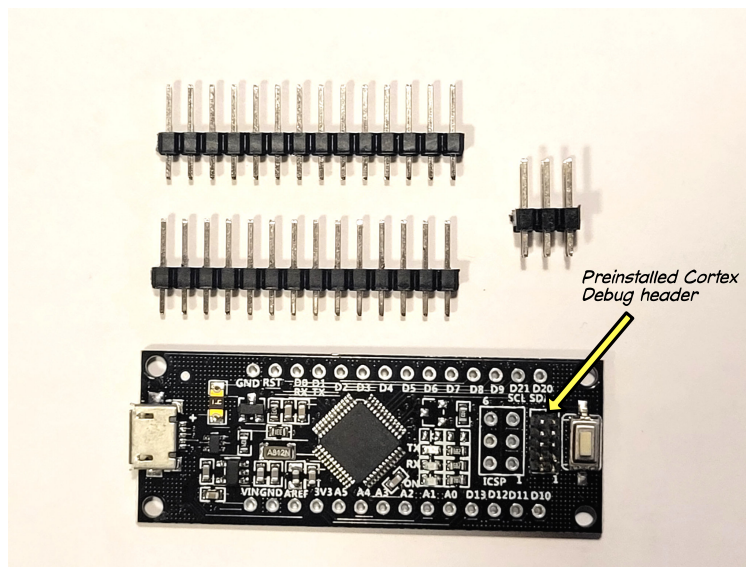


Figure 220.1: An Alternative to the SparkFun SAMD21 Mini.

The board is sold on [Amazon](#), [eBay](#), [AliExpress](#), [MakerPortal](#), [ElectroDragon](#) and other electronic outlets as the “SAMD21 Mini” or the “WeMos SAMD21 Mini” board.² Be sure

¹You will still have to solder in the normal 0.1 inch headers as described in Chapter 20S. You do not need to install the included six-pin ICSP header as it is not used by the Segger IDE.

²Hereinafter referred to as the “WeMos” board.

that the small debugging header is installed from the vendor you choose. Not all of them are. [RobotDyn](#) sold a version of the WeMos board as well, but it no longer appears on their web site.³

The schematic of the RobotDyn board is identical to the SparkFun SAMD21 with the exception of the header connections and the addition of a six-pin ISCP debugging port in addition to the ten-pin Cortex Debug port. We were unable to find a schematic for any of the WeMos boards, but they appear to be identical to the RobotDyn board with one odd difference. While both use the same printed circuit board and include pads for the standard, user-controlled Arduino BUILT_IN LED, neither the LED, the current limiting resistor or the MOSFET driver are populated on any of the boards we have seen other than the RobotDyn version. See Fig. 220.2. You should substitute the TX_LED (on I/O pin PA10) or RX_LED (on PA11) for the blue user LED (on PA17) in the Environment Test Program in §22L.3.2 of the lab. Note, however, that the TX_LED and RX_LED are active low, whereas the Arduino LED is active high, so OUTSET turns the TX and RX LEDs off, while OUTCLR turns them on.

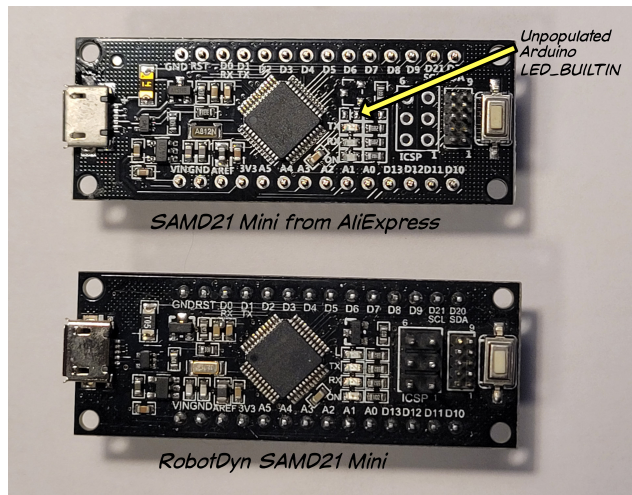


Figure 220.2: RobotDyn SAMD21 vs. WeMos SAMD21 Differences.

Mechanically, the WeMos SAMD21 Mini is much longer than the SparkFun board (53.5mm vs. 33mm), although the width is the same. All the I/O pins on the SparkFun board are available on the WeMos board headers (along with four additional I/O pins).⁴ Most of the I/O pins are in the same order (however D0/RX and D1/TX are reversed) but the pins come out on opposite sides of the board. See Fig. 220.3. If you use the WeMos board this will require some changes to the component placement shown in the images in LAoE.

The WeMos board also appears to be available in a [full-size Arduino UNO footprint](#).

³A sample of the RobotDyn board we tested had the boot loader lock bit set to prevent overwriting the default Arduino loader program. If you purchase a board with this bit set, it must be cleared with the Seeger J-Link downloadable tools to allow the board to be used with the Segger IDE. See “[Use J-Link to change the boot loader protection of a SAM D21](#)” or “[Programming a SAMD bootloader using JLink & Linux](#)”.

⁴The WeMos board brings out two additional Arduino analog I/O pins, A4 (PA05) and A5 (PB02), as well as D21/SCL and D20/SDA which are also available on the SparkFun board but but are brought out to two pads that cannot be used with standard breadboard headers.

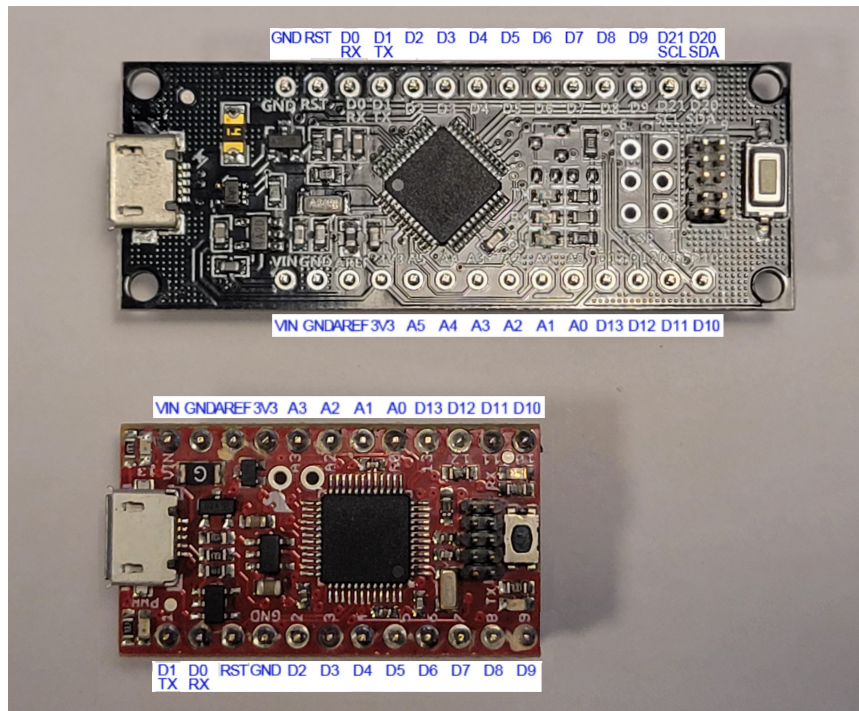


Figure 220.3:
SparkFun SAMD21
Mini vs. WeMos
SAMD21 Size and
Pinout Comparison.

Additional information on the WeMos boards

[SAMD21 Mini Development Boards](#)

[SAMD21 MINI / Wemos D1 SAMD21 M0 Mini Development Board](#)

220.1.2 Other alternative microcontroller boards

We have not tested the following but they may work as substitutes for the SparkFun SAMD21 Mini as well.

220.1.2.1 SparkFun SAMD21 Dev Breakout

This is a [full size Arduino UNO sized version](#) of the mini board. It appears to be almost identical electrically (it includes some additional features such as battery charging) but in a very different form factor. Like the WeMos board, it brings additional I/O pins to the output headers. Unfortunately, it also does not come with a ten-pin Cortex Debug header installed, so you must purchase and install the header yourself.

220.1.2.2 Arduino Zero

This is a [full size Arduino UNO sized](#) M0+ board based on the SAMD21G18 microcontroller. It may come with the ten-pin Cortex Debug header installed, however, the mapping

between the microcontroller pins and the Arduino pin numbers is quite different from the SparkFun board. Nevertheless, it is likely to work with the labs if you are willing to [study the schematic](#) and make the appropriate I/O port changes to the LAoE code examples.⁵

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⁵Indeed, a board with any variant of the Microchip/Atmel SAMD21 should work as long as it includes enough I/O pin connections to complete the labs. You will need to use the board schematic to figure out the I/O to header pin mappings.