# FubarinoTM SD Reference Manual

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## Introduction:

The FubarinoTM SD is a small microcontroller board that uses a powerful PIC32 microcontroller. It is chipKITTM/MPIDE compatible and can run the same sketches that run on an ArduinoTM. It is designed to have all I/O pins on either side of the board in a traditional DIP pattern so that it can easily be plugged into a breadboard. It has a USB connector for power, programming, and a connection to a PC. It also has a microSD slot for increased storage.

Features:

* PIC32MX440F256H (Fubarino SD v1.4) or PIC32MX795F512H (Fubarino SD v1.5) microcontroller, which includes either 256KB or 512KB Flash and 32K or 128KB of RAM
* Supported as development target from within MPIDE
* 45 I/O pins
* microSD slot connected to hardware SPI port
* Pads for 32 KHz crystal
* USB connector for power, programming, and connection to PC (serial, mass storage, etc.)
* Two buttons: RESET for resetting the board, and PRG for getting into bootloader mode and user application use
* USB bootloader pre-programmed at the factory – no other hardware needed to program board

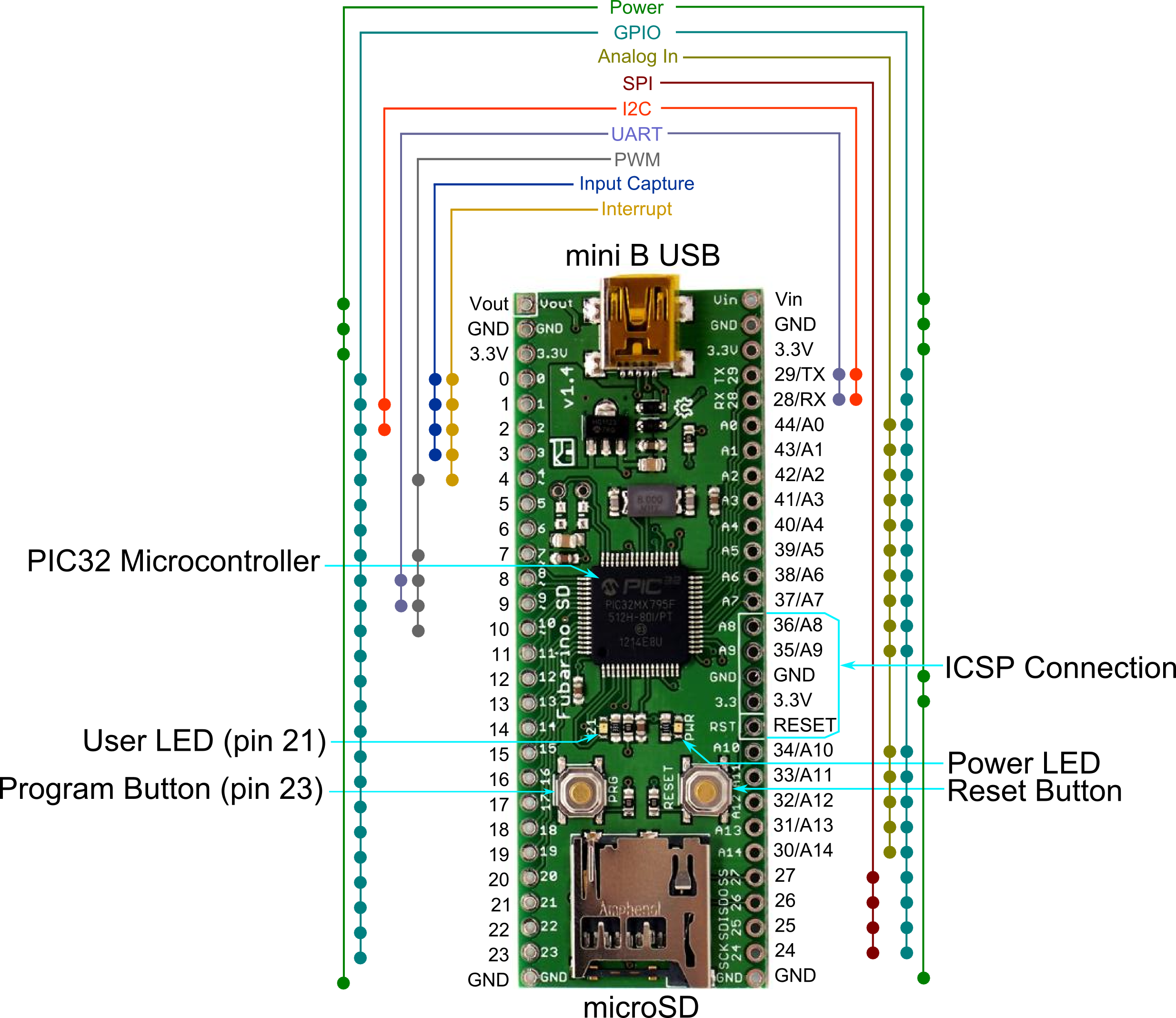


Figure : FubarinoSD Pin Map

## Entering Bootloader Mode

To enter bootloader mode (also called programming mode) simply press the PRG button while pressing and releasing the RESET button. As long as the PRG button is held down when the RESET button is released, the bootloader will start waiting for a new program to be downloaded over USB. It will wait indefinitely.

The bootloader on the Fubarino SD implements the avrdude STK500 v2 protocol, just like the other chipKITTM/MPIDE boards.

## Programming in MPIDE

To program the Fubarino SD board from within MPIDE, simply download the latest MPIDE version, <http://chipkit.net/started/install-chipkit-software/>, unzip and run it, and select Fubarino SD from the Tools->Boards->Fubarino menu. Then, put the Fubarino SD into bootloader mode (see above), and then select the proper serial port in the Tools->Serial Port menu.

After you enter your sketch and click the Upload button, MPIDE will compile your sketch and then upload it to the Fubarino SD. After the upload is complete, the Fubarino SD will automatically reset and immediately begin running your sketch code. This includes sending information to the USB serial, UART1, and UART2.

## Serial communications

The Fubarino SD board has two hardware serial ports: UART2 on pins 29 (TX) and 28 (RX), and UART1 on pins 9 (TX) and 8 (RX). It also has a USB serial port that operates as the default serial port. See the Code Examples wiki page on the Fubarino SD website for example sketch code on how to uses the three serial ports.

* USB serial init: Serial.begin()
* On board serial1 pins 8 (RX), 9 (TX): Serial0.begin()
* On board serial2 pins 28 (RX), 29 (TX): Serial1.begin()

## Using the microSD

The Fubarino SD has a single SPI port, which is tied to the microSD memory card slot as well as pins 24 through 27. The standard SD library that comes with MPIDE will work with the FubarinoSD microSD slot without modifications.

## Power

The Fubarino SD can be powered in a number of different ways.

1. USB : When 5V are present on the USB connector (from a PC or a powered hub for example), the FubarinoSD will use this power source. This power source has a reverse protection diode connection to the 3.3V regulator. If both USB and Vin are powered, whichever is higher will end up providing the power to the regulator.
2. Vin pin: You can also place 2.8V to 13.2V on the Vin pin to power it from an external power source. This power source has a reverse protection diode connection to the 3.3V regulator. If both USB and Vin are powered, whichever is higher in voltage will power the device.
3. 3.3V pin(s): You can power the FubarinoSD by connecting a 3.3V source to either 3.3V pin. You must be careful not to exceed 3.6V on these pins or the PIC32 will be destroyed.

## Fubarino SD Versions

Fubarino SD versions 1.0 to 1.3 were not produced in any number and were not widely distributed.

Fubarino SD version 1.4 is being manufactured and sold by [SeeedStudio](http://www.seeedstudio.com/depot/fubarino-sd-p-1265.html?cPath=132_208). It uses the PIC32MX440F256H processor, which has 256KB of Flash and 32KB of RAM. Because the memory size is different from other Fubarino SD boards, if you have this version of the board, you should use the “Fubarino SD (Seesd)” board in the MPIDE Boards->Fubarino menu.

Fubarino SD v1.5 was the first version Microchip built, and uses a PIC32MX795F512H PIC32 part. This part has 512KB of Flash and 128KB of RAM. Make sure to select “Fubarino SD” from the MPIDE Boards->Fubarino menu for version 1.5 boards.

## Pin Reference

This table provides a cross reference of all functions and labels for each pin of the Fubarino SD. Note that the ‘Fubarino Pin’ is the pin number of the entire board, starting with pin 1 = Vout and correspond to the J2 and J3 pin numbers in the schematic. The ‘Arduino Pin’ is the pin number you use in your code, and is what is listed on the silk screen of the board.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fubarino Pin** | **Arduino Pin** | **Analog** | **PIC32 Pin** | **Silk**  **Name** | **Alt functions** | **5V tolerant?** |
| J2-1 | - | - | - | Vout | - | - |
| J2-2 | - | - | - | Gnd | - | - |
| J2-3 | - | - | - | 3.3V | - | - |
| J2-4 | Pin 0 | - | RD8 | 0 | RTCC/IC1/INT1 | Yes |
| J2-5 | Pin 1 | - | RD9 | 1 | U1CTS/SDA1/IC2/INT2 | Yes |
| J2-6 | Pin 2 | - | RD10 | 2 | SCL1/IC3/PMCS2/PMA15/INT3 | Yes |
| J2-7 | Pin 3 | - | RD11 | 3 | IC4/PMCS1/PMA14/INT4 | Yes |
| J2-8 | Pin 4 | - | RD0 | 4 | OC1/INT0/RD0 | Yes |
| J2-9 | Pin 5 | - | RC13 | 5 | SOSCI/CN1 | No |
| J2-10 | Pin 6 | - | RC14 | 6 | SOSCO/T1CK/CN0 | No |
| J2-11 | Pin 7 | - | RD1 | 7 | U1RTS/OC2 | Yes |
| J2-12 | Pin 8 | - | RD2 | 8 | U1RX/OC3 | Yes |
| J2-13 | Pin 9 | - | RD3 | 9 | U1TX/OC4 | Yes |
| J2-14 | Pin 10 | - | RD4 | 10 | OC5/IC5/PMWR/CN13 | Yes |
| J2-15 | Pin 11 | - | RD5 | 11 | PMRD/CN14 | Yes |
| J2-16 | Pin 12 | - | RD6 | 12 | CN15 | Yes |
| J2-17 | Pin 13 | - | RD7 | 13 | CN16 | Yes |
| J2-18 | Pin 14 | - | RF0 | 14 |  | Yes |
| J2-19 | Pin 15 | - | RF1 | 15 |  | Yes |
| J2-20 | Pin 16 | - | RE0 | 16 | PMD0 | Yes |
| J2-21 | Pin 17 | - | RE1 | 17 | PMD1 | Yes |
| J2-22 | Pin 18 | - | RE2 | 18 | PMD2 | Yes |
| J2-23 | Pin 19 | - | RE3 | 19 | PMD3 | Yes |
| J2-24 | Pin 20 | - | RE4 | 20 | PMD4 | Yes |
| J2-25 | Pin 21 | - | RE5 | 21 | PMD5 | Yes |
| J2-26 | Pin 22 | - | RE6 | 22 | PMD6 | Yes |
| J2-27 | Pin 23 | - | RE7 | 23 | PMD7 | Yes |
| J2-28 | - | - | - | GND | - | - |
| J3-1 | - | - | - | GND | - | - |
| J3-2 | Pin 24 | - | RG6 | SCK/24 | SCK2/PMA5/CN8 | Yes |
| J3-3 | Pin 25 | - | RG7 | SDI/25 | SDI2/PMA4/CN9 | Yes |
| J3-4 | Pin 26 | - | RG8 | SDO/26 | SDO2/PMA3/CN10 | Yes |
| J3-5 | Pin 27 | - | RG9 | SCK/27 | SS2/PMA2/CN11 | Yes |
| J3-6 | Pin 30 | A14 | RB4 | A14 | AN4/C1IN-/CN6 | No |
| J3-7 | Pin 31 | A13 | RB3 | A13 | AN3/C2IN+/CN5 | No |
| J3-8 | Pin 32 | A12 | RB2 | A12 | AN2/C2IN-/CN4 | No |
| J3-9 | Pin 33 | A11 | RB1 | A11 | PGEC1/AN1/VREF-/CVREF-/CN3 | No |
| J3-10 | Pin 34 | A10 | RB0 | A10 | PGED1/AN0/VREG+/CVREF+/PMA6/CN2 | No |
| J3-11 | - | - | MCLR | RST | MCLR | Yes |
| J3-12 | - | - | - | 3.3V | - | - |
| J3-13 | - | - | - | GND | - | - |
| J3-14 | Pin 35 | A9 | RB7 | A9 | PGED2/AN7 | No |
| J3-15 | Pin 36 | A8 | RB6 | A8 | PGEC2/AN6/OCFA | No |
| J3-16 | Pin 37 | A7 | RB8 | A7 | AN8/U2CTS/C1OUT | No |
| J3-17 | Pin 38 | A6 | RB9 | A6 | AN9/C2OUT/PMA7 | No |
| J3-18 | Pin 39 | A5 | RB10 | A5 | TMS/AN10/CVREFOUT/PMA13 | No |
| J3-19 | Pin 40 | A4 | RB11 | A4 | TDO/AN11/PMA12/RB11 | No |
| J3-20 | Pin 41 | A3 | RB12 | A3 | TCK/AN12/PMA11 | No |
| J3-21 | Pin 42 | A2 | RB13 | A2 | TDI/AN13/PMA10 | No |
| J3-22 | Pin 43 | A1 | RB14 | A1 | AN14/U2RTS/PMALH/PMA1 | No |
| J3-23 | Pin 44 | A0 | RB15 | A0 | AN15/OCFB/PMALL/PMA0/CN12 | No |
| J3-24 | Pin 28 | - | RF4 | RX/28 | SDA2/U2RC/PMA9/CN17 | Yes |
| J3-25 | Pin 29 | - | RF5 | TX/29 | SCL2/U2TX/PMA8/CN18 | Yes |
| J3-26 | - | - | - | 3.3V | - | - |
| J3-27 | - | - | - | GND | - | - |
| J3-28 | - | - | - | Vin | - | - |

## Schematic

For the schematic, please see the Fubarino\_SD\_v15\_sch.pdf file on the Fubarino SD website. <https://github.com/fubarino/fubarino.github.com/blob/master/sd/v1.5/Fubarino_SD_v15.sch?raw=true>

## More Information

The best places to get support for Fubarino Mini are

* [Main chipKIT website](http://chipkit.net/)
* [chipKIT forum](http://www.chipkit.org/forum/index.php)

## License

The Fubarino series of boards are released by Schmalz Haus LLC and FubarLabs under a Solderpad Hardware License v0.51. For more information, see: <http://solderpad.org/licenses/SHL-0.51/>

## Developers

The Fubarino series of boards were developed by Rick Anderson of [FubarLabs](http://www.fubarlabs.org/) and Brian Schmalz of [Schmalz Haus LLC](http://www.schmalzhaus.com/). They are registered chipKITTM boards and are designed to be programmed with the MPIDE system.