# Fubarino™ Mini Reference Manual

Last Revision: May 4th, 2013 – Applies to version 1.5 of Fubarino™ Mini hardware

## Introduction:

The Fubarino™ Mini 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.

Features:

* PIC32MX250F128D-50I/ML microcontroller, which includes 128KB Flash and 32K RAM
* Supported as development target from within MPIDE
* Max 33 I/O pins (normally 27)
* 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

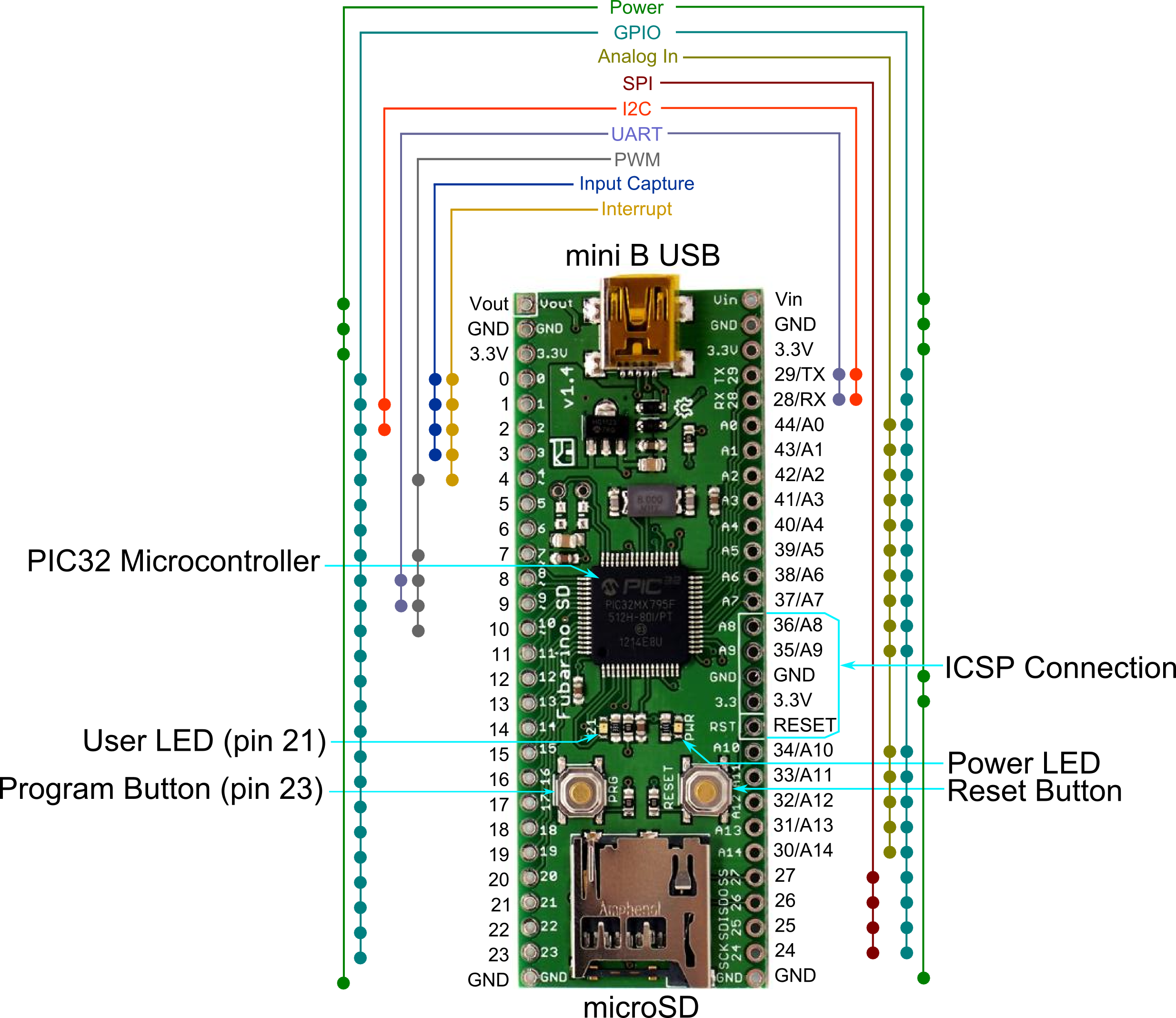


Figure : Fubarino™ Mini Pin Map

## 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 BUTTON button comes out of 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™ Mini implements the avrdude STK500 v2 protocol, just like the other chipKITTM/MPIDE boards. For Windows users, you may need to install the drivers\Stk500v2.ini file so that the FubarinoTM Mini is recognized by the PC. Mac and Linux users do not have to install any drivers.

## Programming in MPIDE

To program the Fubarino Mini board from within MPIDE, simply download the [latest MPIDE version](http://bit.ly/getmpide), http://bit.ly/getmpide, unzip and run it, and select “Fubarino Mini chipKIT” from the Tools->Boards->Fubarino menu. Then, put the Fubarino Mini 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 upload it to the Fubarino Mini. After the upload is complete, the Fubarino Mini 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 Mini 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 Mini 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()

## Power

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

1. USB: When 5V is present on the USB connector (from a PC or a powered hub for example), the Fubarino Mini 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 Fubarino Mini 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 Mini Versions

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

Fubarino Mini version 1.4 made its way into several user's hands, and is functionally identical to version 1.5 except that it uses a 40Mhz rated PIC32 part. Thus the bootloader is slightly different, and the “Fubarino Mini” board should be chosen in MPIDE.

Fubarino Mini v1.5 was the first version Microchip built, and uses a 50MHz rated PIC32 part. It's internal clock speed is set to 48MHz, and thus uses a slightly different bootloader than the v1.4 boards. Make sure to select “Fubarino Mini chipKIT” from the MPIDE boards menu for version 1.5 boards.

## Peripheral Pin Select

The PIC32MX250 part used on Fubarino Mini has a Peripheral Pin Select function for almost all of its I/O pins. When writing sketches for the Fubarino Mini, you must remember to connect an internal peripheral (like SPI or UART) to a particular set of I/O pins using the PPS functions (ppsInputSelect() and ppsOutputSelect()) before trying to use the peripheral. See the example code on the Fubarino Mini Github site for more detailed information.

## Pin Reference

This table provides a cross reference of all functions and labels for each pin of the Fubarino Mini. 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. (Note that the Mini is too small for all pins to have numbers printed next to each pin – so use the diagram above to see the pin number for every pin on the board.)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fubarino Pin** | **Arduino Pin** | **Analog** | **PIC32 Pin** | **Silk**  **Name** | **Alt functions** | **5V tolerant?** |
| J1-1 | - | - | - | Vout | - | - |
| J1-2 | - | - | - | G | GND | - |
| J1-3 | - | - | - | 3V | - | - |
| J1-4 | Pin 0 | Yes | RB13 | 0 | AN11/RPB13/CTPLS/PMRD | Yes |
| J1-5 | Pin 1 | - | RA10 | 1 | PGED/TMS/PMA10 | Yes |
| J1-6 | Pin 2 | - | RA7 | 2 | PGEC/TCK/CTED8/PMA7 | Yes |
| J1-7 | Pin 3 | Yes | RB14 | 3 | CVREF/AN10/C3INB/RPB14/VBUSON/ SCK1/CTED5 | Yes |
| J1-8 | Pin 4 | Yes | RB15 | 4 | AN9/C3INA/RPB15/SCK2/CTED6/PMCS1 | Yes |
| J1-9 | Pin 5 | Yes | RA0 | 5 | PGED3/VREF+/CVREF+/AN0/C3INC/ RPA0/CTED1/PMD7 | No |
| J1-10 | Pin 6 | Yes | RA1 | 6 | PGEC3/VREF-/CVREF-/AN1/RPA1/ CTED2/PMD6 | No |
| J1-11 | Pin 7 | Yes | RB0 | 7 | PGED1/AN2/C1IND/C2INB/C3IND/ RPB0/PMD0 | Yes |
| J1-12 | Pin 8 | Yes | RB1 | 8 | PGEC1/AN3/C1INC/C2INA/RPB1/ CTED12/PMD1 | Yes |
| J1-13 | Pin 9 | Yes | RB2 | 9 | AN4/C1INB/C2IND/RPB2/SDA2/ CTED13/PMD2 | Yes |
| J1-14 | Pin 10 | Yes | RB3 | 10 | AN5/C1INA/C2INC/RTCC/RPB3/SCL2/  PMWR/CNB3 | Yes |
| J1-15 | Pin 11 | Yes | RC0 | 11 | AN6/RPC0 | Yes |
| J1-16 | Pin 12 | Yes | RC1 | 12 | AN7/RPC1 | Yes |
| J2-17 | Pin 13 | Yes | RC2 | 13 | AN8/RPC2/PMA2 | Yes |
| J2-18 | Pin 14 | - | RA2 | 14 | OSC1/CLKI/PRA2 | Yes |
| J2-19 | Pin 15 | - | RA3 | 15 | OSC2/CLKO/RPA3 | Yes |
| J2-20 | Pin 16 | - | RA8 | 16 | TDO/RPA8/PMA8 | Yes |
| J2-1 | Pin 17 | - | RB4 | 17 | SOSCI/PRB4 | Yes |
| J2-2 | Pin 18 | - | RA4 | 18 | SOSCO/RPA4/T1CK/CTED9 | Yes |
| J2-3 | Pin 19 | - | RA9 | 19 | TDI/RPA9/PMA9 | Yes |
| J2-4 | Pin 20 | Yes | RC3 | 20 | AN12/RPC4 | Yes |
| J2-5 | Pin 21 | - | RC4 | 21 | RPC4/PMA4 | Yes |
| J2-6 | Pin 22 | - | RC5 | 22 | RPC5/PMA3 | Yes |
| J2-7 | Pin 23 | - | RB5 | 23 | PRB5/USBID | Yes |
| J2-8 | Pin 24 | - | RB7 | 24 | RPB7/CTED3/PMD5/INT0 | - |
| J2-9 | Pin 25 | - | RB8 | 25 | RPB8/SCL1/CTED10/PMD4 | - |
| J2-10 | Pin 26 | - | RB9 | 26 | RPB9/SDA1/CTED4/PMD3 | Yes |
| J2-11 | Pin 27 | - | RC6 | 27 | RPC6/PMA1 | Yes |
| J2-12 | Pin 28 | - | RC7 | 28 | RPC7/PMA0 | Yes |
| J2-13 | Pin 29 | - | RC8 | 29 | RPC8/PMA5 | - |
| J2-14 | Pin 30 | - | RC9 | 30 | RPC9/CTED7/PMA6 | - |
| J2-15 | Pin 31 | - | RB10 | 31 | PGED2/RPB10/D+/CTED11 (used) | - |
| J2-16 | Pin 32 | - | RB11 | 32 | PGEC2/RPB11/D- | - |
| J2-17 | - | - | - | G | GND | - |
| J2-18 | - | - | - | 3V | 3.3V | - |
| J2-19 | - | - | - | G | GND | - |
| J2-20 | - | - | - | Vin | Vin | - |

## Schematic

For the schematic, please see the [Fubarino\_Mini\_v15\_sch.pdf](https://github.com/fubarino/fubarino.github.com/blob/master/mini/v15/FubarinoMini_v15_sch.pdf?raw=true) file on the Fubarino Mini website. <https://github.com/fubarino/fubarino.github.com/blob/master/mini/v15/FubarinoMini_v15_sch.pdf?raw=true>

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