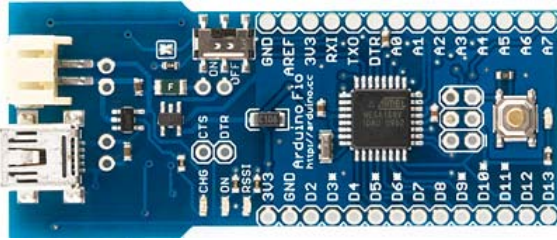# Arduino Fio

Overview

The Arduino Fio is a microcontroller board based on the ATmega328P (datasheet (http://www.atmel.com/Images/Atmel-8271-8-bit-AVR-Microcontroller-ATmega48A-48PA-88A-88PA-168A-168PA-328-328P_datasheet.pdf)) runs at 3.3V and 8 MHz. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 8 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. It has connections for a Lithium Polymer battery and includes a charge circuit over USB. An XBee socket is available on the bottom of the board.

The Arduino Fio is intended for wireless applications. The user can upload sketches with an a FTDI cable or Sparkfun breakout board. Additionally, by using a modified USB-to-XBee adaptor such as XBee Explorer USB, the user can upload sketches wirelessly. The board comes without pre-mounted headers, allowing the use of various types of connectors or direct soldering of wires.

The Arduino Fio was designed by Shigeru Kobayashi and SparkFun Electronics, and manufactured by SparkFun Electronics.

Schematic & Reference Design

EAGLE files: arduino-fio-reference-design.zip (http://arduino.cc/en/uploads/Main/arduino-fio-reference-design.zip)

Schematic: Arduino-Fio-schematic.pdf (http://arduino.cc/en/uploads/Main/Arduino-Fio-schematic.pdf)

Summary

Microcontroller	ATmega328P
Operating Voltage	3.3V
Input Voltage	3.35 -12 V
Input Voltage for Charge	3.7 - 7 V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40 mA
Flash Memory	32 KB (of which 2 KB used by bootloader)
SRAM	2 KB
EEPROM	1 KB
Clock Speed	8 MHz
Width	28 mm
Length	65 mm
Weigth	9 g

Power

The Arduino Fio can be powered with an FTDI cable or breakout board connected to its six pin headers (as marked on the bottom side), or with a regulated 3.3V supply on the 3V3 pin or a Lithium Polymer battery on the BAT pins.

The power pins are as follows:

- **BAT.** For supplying a Lithium Polymer battery to the board.
- **3V3.** The regulated 3.3 volt supply pins.
- **GND.** Ground pins.

Memory

The ATmega328P has 32 KB of flash memory for storing code (of which 2 KB is used for the bootloader). It has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library (http://www.arduino.cc/en/Reference/EEPROM)).

Input and Output

Each of the 14 digital pins on the Fio can be used as an input or output, using pinMode() (http://arduino.cc/en/Reference/PinMode), digitalWrite() (http://arduino.cc/en/Reference/DigitalWrite), and digitalRead() (http://arduino.cc/en/Reference/DigitalRead) functions. They operate at 3.3 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- **Serial: RXI (D0) and TXO (D1).** Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the DOUT and DIN pins of the XBee modem socket.
- **External Interrupts: 2 and 3.** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() (http://arduino.cc/en/Reference/AttachInterrupt) function for details.
- **PWM: 3, 5, 6, 9, 10, and 11.** Provide 8-bit PWM output with the analogWrite() (http://arduino.cc/en/Reference/AnalogWrite) function.
- **SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).** These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- **LED: 13.** There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Fio has 8 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). The analog inputs measure from ground to Vcc. Additionally, some pins have specialized functionality:

- **I²C: 4 (SDA) and 5 (SCL).** Support I²C (TWI) communication using the Wire library (http://arduino.cc/en/Reference/Wire).

There are couple of another pins on the board:

- **AREF.** Reference voltage for the analog inputs. Used with analogReference() (http://arduino.cc/en/Reference/AnalogReference).
- **DTR.** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

There are also 8 unsoldered holes on the board:

- **BAT +** and **BAT -.** To be connected to a battery. Typically used when you don't want to connect a battery to the battery connector.
- **CHG 5V** and **CHG -.** To be connected to charging terminals. Typically used to add an external connector for charging.
- **SW.** Connected to the power switch on the board. Typically used to add an external power switch.
- **CTS.** Connected to the #CTS/DIO7 pin of the XBee socket. Typically used to do sleep control for a XBee modem.
- **DTR.** Connected to the #DTR/SLEEP_RQ/DI8 pin of the XBee socket. Typically used to do sleep control for a XBee modem.

See also the mapping between Arduino pins and ATmega328P ports (http://arduino.cc/en/Hacking/PinMapping168).

Communication

The Arduino Fio has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328P provides UART TTL serial communication, which is available on digital pins 0 (RX) and 1 (TX). The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino Fio board via an external serial connection. We recommend using an FTDI Basic or FTDI cable. The on board mini-USB connector is only used for charging and does not allow for serial communication.

A SoftwareSerial library (http://www.arduino.cc/en/Reference/SoftwareSerial) allows for serial communication on any of the Fio's digital pins.

The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the reference (http://arduino.cc/en/Reference/Wire) for details. To use the SPI communication, please see the ATmega328P datasheet.

Physical Characteristics

The dimensions of the Fio PCB are approximately 1.1" x 2.6".

Related Pages

The Arduino Fio can be programmed wirelessly over its XBee radio. See the Arduino Fio Programming (http://arduino.cc/en/Main/ArduinoBoardFioProgramming) page for the details.

Because the Fio communicates over XBee radios, the following Sketch-writing tips (http://arduino.cc/en/Main/ArduinoBoardFioTips) will help you avoid unexpected errors.

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