Processor

The microcontroller on the board is a PIC24FJ128GB206, which is a 16-bit
processor with 128KB of program memory and 96KB of data memory. We will
clocking the PIC at 16MHz (FCY = 16MHz) from the internal oscillator.

Power

The board can either be powered from the USB cable or from a battery pack or
plug-in transformer supplying 4-12 V DC connected to the barrel jack (2.1-mm,
center positive). If both power sources are present, the barrel jack is used.

VDD for the board is generated by a 3.3-V linear regulator that can supply a
maximum current of 250 mA. The supply also passes through a Shottky diode,
which has a forward voltage drop of about 300 mV, which makes VDD just about
3 V.

The center pin of the barrel conenctor is routed directly to the pin labeled
VIN in the power header. Similarly, VBUS from the USB connector is routed
directly to the pin labeled VBUS in the power header. The pins labeled VDD
in the power header and the digital header are connected to the 3-V VDD for
the board.

Tactile Switches/Bootloader

There are four tactile switches on the board: three black user switches
(located near the digital header) labeled SW1, SW2, and SW3, and one red
reset switch (located near the power header). All of these tactile switches
are normally open and pull down to ground against a 10-k¿ pull-up resistor
when depressed. Consequently, the tactile switches are active low.

The PIC is preprogrammed with a bootloader firmware that we will be using to
program the PIC via USB. When the PIC is reset, it runs the bootloader. The
bootloader checks to see if SW1 is depressed. If not, the bootloader jumps to
the user application space and starts executing whatever firmware is there.
If SW1 is depressed, the bootloader attempts to connect to a host PC via USB.
If no USB cable is present, the bootloader will flash LED1 at about 10 Hz to
signal that it is waiting to be connected. Once the device is programmed, you
can either run your application by sending the bootloader the START_USER
command or by pressing and releasing the reset tactile switch.

I/O Headers

The I/O headers on the board are meant to be more-or-less compatible with those
of the Arduino UNO, so that it might be possible to use shields designed for
the UNO with our board. There are some differences, however.

Perhaps the most important difference is that the PIC we are using is a 3-V
part rather than the 5-V part that is on the UNO. While some of the pins on
the PIC are 5-V tolerant, most are NOT. If you apply 5 V to a pin that is not
5-V tolerant, chances are you will destroy that pin's I/O driver. While
replacing the PIC is possible, it is no fun. Please be careful!

Another difference is that where AREF appears in one of the digital headers on
the UNO, VDD appears in our board. Finally, the analog pins A0...A5 are
reversed between the UNO and our board.

PIC24FJ128GB206 Connections

Pin	Name	Connections	Notes
1	RE5/CN63	Audio jack pin 4 (cable detect), 100K pull-up resistor to VDD	Input, goes high if cable inserted
2	RE6/CN64/SCL3	SCL3	(D1 on prototype board)
3	RE7/CN65/SDA3	SDA3	(D0 on prototype board)
4	RG6/CN8/RP21	Audio jack pin 3 (Rx)	UART Tx
5	RG7/CN9/RP26	Audio jack pin 2 (Tx), 10K pull-down resistor to GND	UART Rx
6	RG8/CN10/RP19	RN-42 RTS	UART CTS
7	_MCLR	ICD3 header (pin 1, _MCLR), 10K pull-up resistor to VDD, tactile switch to GND	
8	RG9/CN11/RP27	RN-42 CTS	UART RTS
9	VSS	GND	
10	VDD	VDD, 0.1uF capacitor to GND	
11	AN5/RB5/CN7/RP18	A5	
12	AN4/RB4/CN6/RP28	A4	
13	AN3/RB3/CN5	A3	
14	AN2/RB2/CN4/RP13	A2	
15	AN1/RB1/CN3/RP1/VREF-	A1	
16	AN0/RB0/CN2/RP0/VREF+	A0	
17	RB6/CN24/RP6/PGEC2	ICD3 header (pin 5, PGC), RN-42 Tx	UART Rx
18	RB7/CN25/RP7/PGED2	ICD3 header (pin 4, PGD), RN-42 Rx	UART Tx
19	AVDD	VDD, 0.1uF capacitor to GND	
20	AVSS	GND	
21	RB8/CN26/RP8	MOSI: MMA7455L pin 13, MicroSD card pin 3, L3GD20 pin 3, 10K pull-down to GND	SPI SDO
22	RB9/CN27/RP9	SCK: MMA7455L pin 14, MicroSD card pin 5, L3GD20 pin 2, 10K pull-down to GND	SPI SCK
23	RB10/CN28	MicroSD card pin 2 (_CS), 10K pull-up to VDD	Output, active low
24	RB11/CN29	L3GD20 pin 5 (_CS), 10K pull-up to VDD	Output, active low
25	VSS	GND	
26	VDD	VDD, 0.1uF capacitor to GND	
27	RB12/CN30	SW3: 10K pull-up to VDD, tactile switch to GND	Input
28	RB13/CN31	MMA7455L pin 7 (_CS), 10K pull-up to VDD	Output, active low
29	RB14/CN32/RP14	MISO: MMA7455L pin 12, MicroSD card pin 7, L3GD20 pin 4, 10K pull-down to GND	SPI SDI
30	RB15/CN12/RP29	D4	
31	RF4/CN17/RP10/SDA2	D2	
32	RF5/CN18/RP17/SCL2	D3	
33	RF3/RP16	D5	
34	VBUS	100K resistor to VBUS on USB connector	
35	VUSB	VDD (3.3V)	
36	D-	D- on USB connector	
37	D+	D+ on USB connector	
38	VDD	VDD, 0.1uF capacitor to GND	
39	OSCI/CLKI/RC12/CN23	SW2: 10K pull-up to VDD, tactile switch to GND	Input
40	OSCO/CLKO/RC15/CN22	SW1: 10K pull-up resistor to VDD, tactile switch to GND	Input, checked by bootloader
41	VSS	GND	
42	RD8/RP2	D6	
43	RD9/SDA1/RP4	D8	
44	RD10/SCL1/RP3	D9	
45	RD11/RP12	D7	
46	RD0/RP11	D10	
49	RD1/RP24	D11	
50	RD2/RP23	D12	
51	RD3/RP22	D13	
52	RD4/RP25/CN13	D1	
53	RD5/RP20/CN14	D0	
55	RD7	LED1: 0805 LED in series with 1K resistor to GND	Output
56	VCAP/VDDCORE	10uF capacitor to GND, 0.1uF capacitor to GND	
57	ENVREG	VDD	instead of GND as on 24FJ64GB002
58	RF0	LED2: 0805 LED in series with 1K resistor to GND	Output
59	RF1	LED3: 0805 LED in series with 1K resistor to GND	Output
60	RE0/CN58	MicroSD card detect, 10K pull-down to GND	Input, goes high if SD card inserted
61	RE1/CN59	MMA7455L pin 8 (INT1)	Input
62	RE2/CN60	MMA7455L pin 9 (INT2)	Input
63	RE3/CN61	L3GD20 pin 6 (INT2)	Input
64	RE4/CN62	L3GD20 pin 7 (INT1)	Input