SPARO board for dsPics [33FJ64GP802 and 33FJ128GP802]

S. Oliver 29 May 2012

A "Sparo" board is a basic utility board for a 28-pin SDIP dsPic.

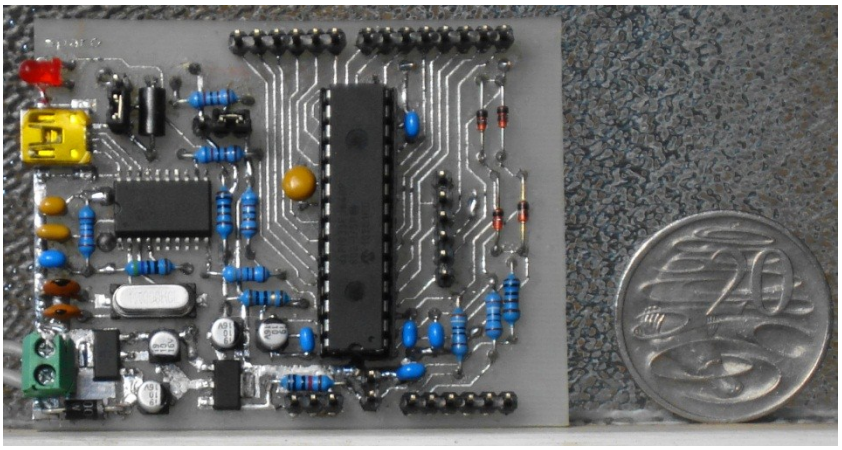
It contains the dsPic, power supply, a USB-serial bridge, and digital and analogue i/o connections in a small footprint. It provides 14 digital i/o and two analog input lines, as well as the serial-USB link. The digital i/o accesses port B cleanly as bits 0-13, at the expense of some dsPic functionality.

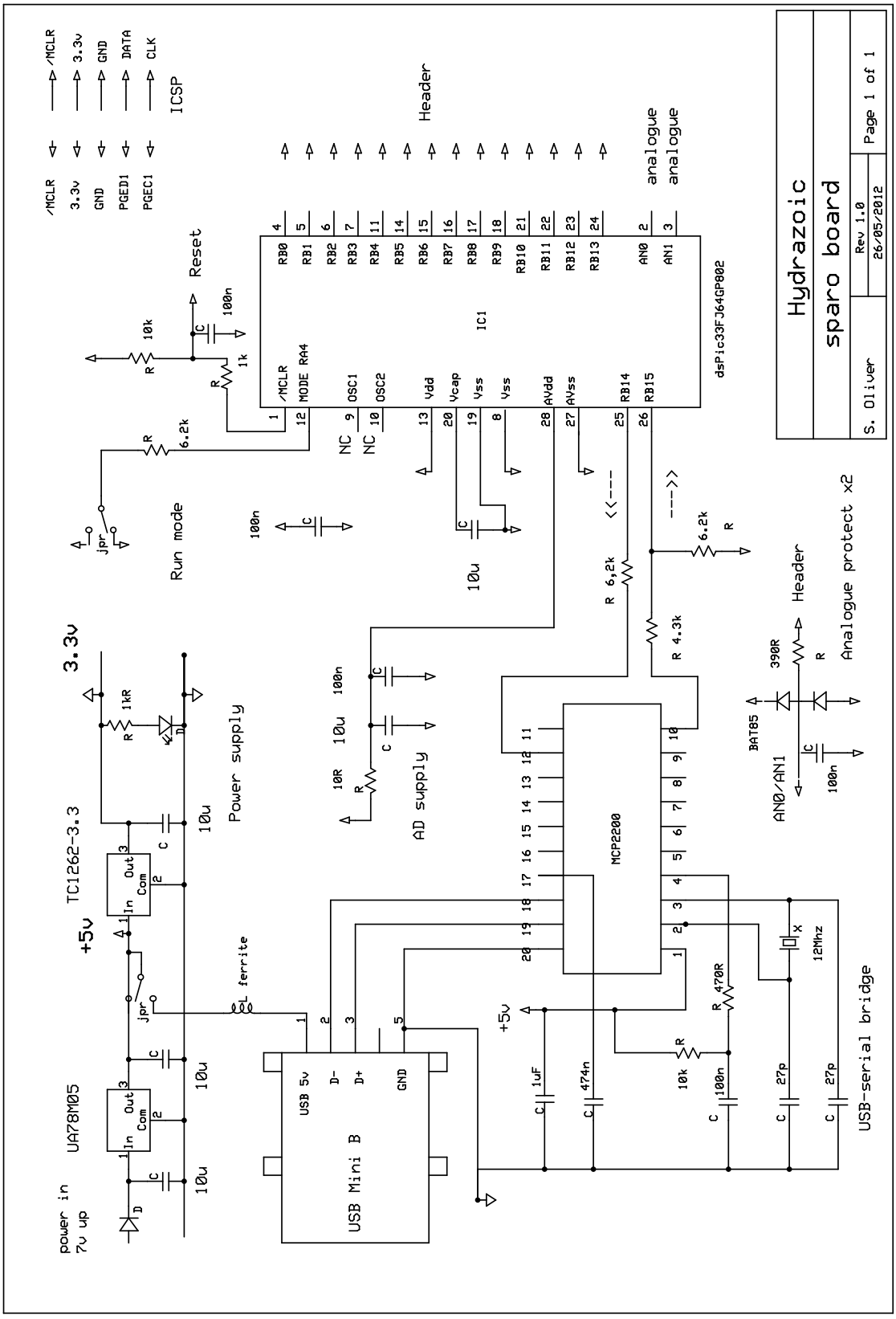
C and MPLAB can be used to program the dsPic via ICSP, or an interpreter eg www.hydrazoic.info can run on the dsPic and connect using a serial terminal. At the default clock speed it draws approx 15 mA, rising to 32 when the USB is connected. By setting a jumper, it can be powered from the USB connection instead of external power.

To reduce input noise and overvoltage, the two analog lines have simple filters and safeguards, and the A/D supply is filtered. The intended scope is for DC/low frequency measurements.

The schematic shows the small component count. For ease of construction the board is a small single-sided PCB with connecting links. It is illustrated below. The scale can be judged by the coin, which is approx. 28 mm (just over an inch) in diameter.

The board can be thought of as four modular areas, which are the power supply, the USB bridge, the dsPic, and the analog clip/filter circuits. The power supply, with four electrolytic capacitors and two regulators, is at lower left. Above that is the USB bridge, crystal, and mini-B socket. The dsPic is at middle-right and the analog filters etc at the right. The pin header at the top is the 14 pin digital i/o, and the pins at the bottom are power and analog. The pin header format is generally arranged in the Arduino pattern.




Hydrazoic
sparo board
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/MCLR
3.3v
GND
DATA
CLK
ICSP
Header
analogue
analogue
dsPic33FJ64GP802
IC1
Reset
Run mode
Power supply
AD supply
Analogue protect x2
TC1262-3.3
UA78M05
power in
7v up
+5v
3.3v
USB Mini B
USB-serial bridge
MCP2200
BAT85
AN0/AN1
12Mhz

Configuration

The two small jumper pin groups configure the board. The 5 volt power from the USB can be used to power the board by moving the jumper to next to the led. (Don't use the two power sources simultaneously.) The other group connects RA4 with a resistor to +ve or ground, and is the run mode setting, either program mode or autorun, used by SPA-R (Hydrazoic).

Analogue measurement.

The analog inputs are connected via simple filter and clip circuits. Small series resistors limit overcurrent, followed by reverse schottky diodes to the rails to clip the inputs. A small capacitor then completes the filtering. This is adequate for DC and low frequency signals. The components can be changed with careful soldering. The schottky diodes can leak about a microamp which should be taken into account. The accuracy is limited by the regulator stability; if a very precise measurement is needed, a precision reference potential can be supplied to one input and used to calibrate the other.

Digital i/o.

The 14 digital pins are accessed as port B as usual.

Construction.

The SMD components can be soldered easily enough : build a bead of solder (and flux) on the pad, position the component pin on the pad by holding the component in place with tweezers, and press the component pin onto the pad with the soldering iron. The solder will melt and visibly wet the pin, which is the cue to remove the soldering iron. You will need a good magnifier.
For access reasons, the main regulator should be placed first followed by the electrolytic capacitors. The USB socket is next, then the MCP2200 et al.

Notes

There is a little "overengineering". Technically the USB bridge is running off 5 v so does not require its switched power capacitor (470 nF), and the analog filters are conservative at the expense of frequency response. The electrolytic capacitors in the power supply are a little higher capacitance than that recommended for using USB as a power source. However, the board gives good results. The 16v rating of the input power capacitor is maybe a little low.

The USB connection process depends on a clean uninterrupted power-up. If a message appears during the connect about USB unrecognized or similar, it means the process has stalled. Disconnect the board and turn the power off, wait a minute and retry. Do not touch the board wiring during the process. Repeated errors usually mean the power (eg battery) is failing.

Parts List

Capacitors			
	0.1 uF	Monolithic	6
	470 nF	"	1
	1 uF	"	1
	27 pF	Ceramic	2
	10 uF	Electrolytic (16v up)	4
	10 uF	Tantalum low esr	1
Resistors			
	10 R		1
	390 R		2
	470 R		1
	1 K		2
	4.3 K		1
	6.2 K		2
	10 K		2
Diodes			
	BAT85 schottky or similar		4
	IN4004 power		1
	Led 3mm generic		1
IC's			
	dsPic 33FJ64GP802 or 33FJ128GP802		1
	MCP2200		1
	UA78M05 reg		1
	TCI262-3.3 reg		1
Misc			
	Crystal 12MHz		1
	Ferrite choke RF filter		1
	USB Mini-B socket		1
	Power connector 3.5 mm Dinkle*		1
	Molex connector 6 pin for ICSP		1
	Header pins single bank 8 pin		1
	" 6 pin		2
	" 3 pin		2
	" 2 pin		1
PCB			
	Sparo board		1

*Before soldering, cut the plastic base off and remove the shell. This allows the metal connections to solder to the pcb. Replace the shell after soldering.

Installation

To install the dsPic software, it is burnt into the SDIP dsPic33FJ64GP802 or dsPic33FJ128GP802 on the board. The ICSP pins on the board are used with a pickit2/3 or similar. Alternatively the dsPic can be preprogrammed and simply placed in the board socket.
For the USB connection, the board is powered up and then connected to a PC with USB. The first time the PC is connected, Windows 7 will install a driver and report a problem. Use Device Manager to replace the driver with the MCP2200.inf file.

Pin **connections (dsPic).**

1	/MCLR	Reset	ICSP
2	AN0	Analog	
3	AN1	Analog	
4	RB0	RB0	ICSP
5	RB1	RB1	ICSP
6	RB2	RB2	
7	RB3	RB3	
8	Ground		
9	OSC	NC	
10	OSC	NC	
11	RB4	RB4	
12	RA4	Mode switch	
13	Power +	3.3v	ICSP
14	RB5	RB5	
15	RB6	RB6	
16	RB7	RB7	
17	RB8	RB8	
18	RB9	RB9	
19	Ground	0v	ICSP
20	Vcap		
21	RB10	RB10	
22	RB11	RB11	
23	RB12	RB12	
24	RB13	RB13	
25	RB14	I/O : Output to USB/Serial	
26	RB15	I/O: Input from USB/Serial	
27	AVss	A/D ground	
28	AVdd	A/D power	

Document log :
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