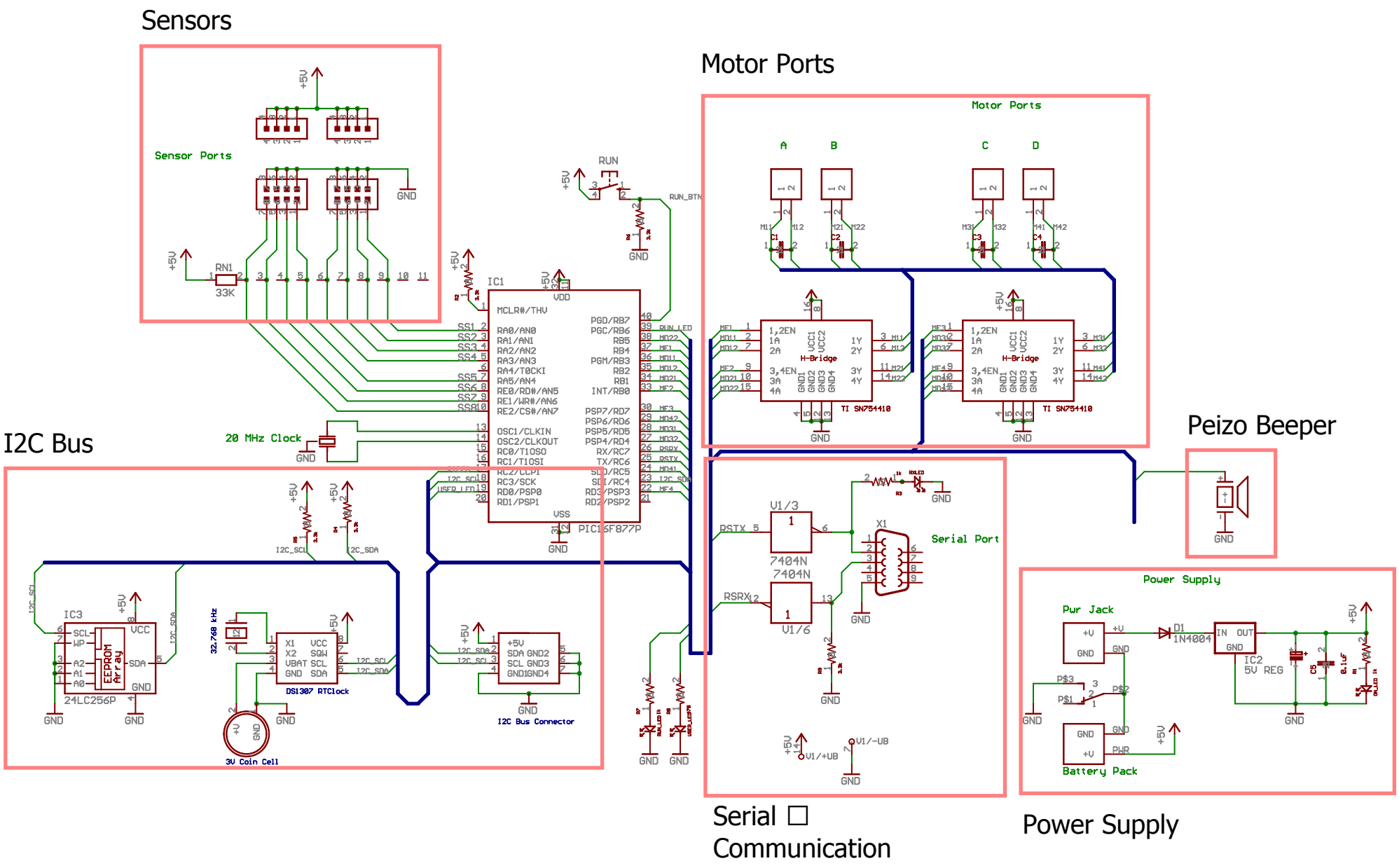
Sensors
Sensor Ports
RN1
33K
Motor Ports
Motor Ports
A
B
C
D
H-Bridge
TI SN754410
RUN
RUN_BTN
IC1
MCLR#/THV
PIC16F877P
20 MHz Clock
I2C Bus
IC3
24LC256P
EEPROM Array
32.768 kHz
DS1307 RTClock
3V Coin Cell
I2C Bus Connector
Peizo Beeper
Serial Port
7404N
Serial ☐
Communication
Power Supply
Pwr Jack
D1
1N4004
IC2
5V REG
Battery Pack
Power Supply

Sensors

All the eight sensor ports use the F877's built-in 10 bit ADCs (pins AN0-AN7). The simplest way to measure resistive sensors is to use a voltage divider. Each sensor port is connected to the +5v supply through a 33K resistor, which serves as the first half of the divider circuit. The second resister is the sensor itself which is connected to ground. Thus the sensor readings can be calculated from the following equation:

```
Sensor Value = 1023 (Rs / (Rs + Rd))
```

Where

`Rs` = Sensor resistance

`Rd` = 33k

Each sensor port has a third pin which provides a +5v supply. This supply allows the use of active sensors, such as reflective IR, Hall Effect, and audio sensors.

Motor Ports

The four motor ports are driven by the TI SN754410 H-Bridge driver chips. Each chip has two h-bridges and can supply current up to 1A. The state of each motor is controlled by three input pins: the enable pin and two direction-control (A) pins. There are four possible motor states: On clockwise (Enable=1, 1A=0, 2A=1), On counter-clockwise (110), Off (0xx), and Break (111). Motor power control is accomplished by pulsing the enable pins. The more frequent we pulse the port, the more power it has.

Each motor port has a built-in bypass capacitor. This prevents noise from some motors that could potentially disrupt the board.

Serial Communication

The GoGo board uses the F877's hardware UART (pins RC6, RC7). We run these pins through an inverter to make the F877's TTL signal compliant with the RS232 logic signal. We are actually cheating a little bit here. Theoretically, in addition to inverting the logic signals we also need to convert the TTL signal levels (0-5v) to RS232's +-12v levels. But it turns out that the 0-5v are acceptable levels. The reason we are doing this is because the HEX inverter chip is much cheaper than the RS232 level converter chips (such as the MAX232 chip).

The TX (transmit) pin is connected to an LED which allows us to monitor the board's serial activity. The RX pin has a 3.3k pull-down resister to prevent the RX pin from floating when the serial cable is disconnected. A floating RX pin can create noise that disrupts the PIC.

Piezo Beeper.

The piezo device is connected to one of the F877's PWM pins (RC2). The tone generated by the piezo device depends on the PWM frequency which can be easily programmed to the PIC.

I2C Bus

The I2C bus opens up the possibility to add extension modules to the GoGo board. I2C bus requires only two lines: the data and clock lines. The F877 has hardware support for the I2C bus (pins RC3, RC4). Both pins have a 3.3K pull-up resister. The I2C bus is connected to the EEPROM chip, real-time clock chip, and to the I2C extension bus port.

Power Supply

If an AC Adapter is used, the input voltage will go through a 1N4004 diode (to protect the board if the power polarity is mistakenly inverted) and gets regulated to 5V by the LM7805 power regulator. The output voltage is stabilized by the 100 uF and 0.1 uF capacitors.

If batteries are used, the input voltage is directly connected to the board's +5v power line.