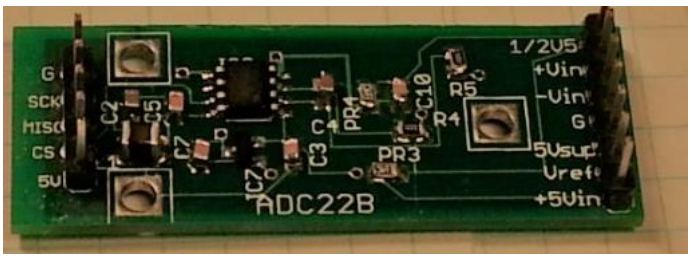
AD22B

On Measurement

Low Noise, High Resolution 22B ADC w SPI Interface

Manufactured by On Measurement 4U, www.onmeasurement.com

Features



- The MCP3550-60 from Microchip Technology Inc.
- It's a 22 Bit ADC (21 Bit 0 to 5V)
- Uses the SPI Interface, up to 10sps
- 3 µV Typical Offset Error (2.5V range)
- 3.3 to 5.5V supply operating range
- On board low noise power supply filter
- On board 2.5V Voltage Reference
- On board precision 500Kohm X2 voltage divider for 0-5V input.
- Direct signal input both as 0V to 2.5V and differential -/+2.5V for your highest resolution.
- On board RC differential input voltage filter for your signals (Anti-Aliasing filter)
- Clean analog supply and voltage reference available for use with sensors.

Applications

5.5 Digit Digital Volt Meter (when calibrated)
Strain Gauge Measurements
High Resolution Measurements of low cost, precision analog sensors

Professional Circuit

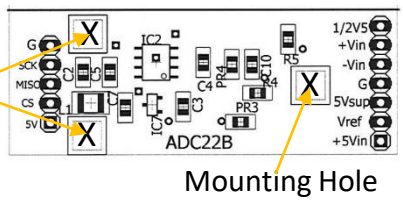
The AD22B is built on a 4 layer circuit board using a ground plane to reduce external coupled electrical noise. Inputs provide an RC filter for removing background wall outlet noise. The signal input options are:

1. 0 to 5V Single ended (Standard Arduino)
2. 0 to 2.5V Single ended
3. 0 to 2.5V Differential

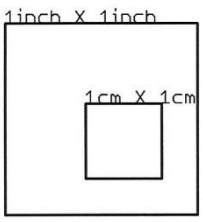
For 0 to 5V analog input, use pin 1 with jumpers between pins 4 & 5, pins 6 & 7. For 0 to 2.5V input use pin 6 with jumper between pins 4 & 5. For differential input use pins 5 (-Vin) and 6 (+Vin).

Example Sketches are available at onmeasurement.com using the AD22B with an Arduino and micro-SD card sketch.

Mounting Holes



Mounting Hole



Printer test

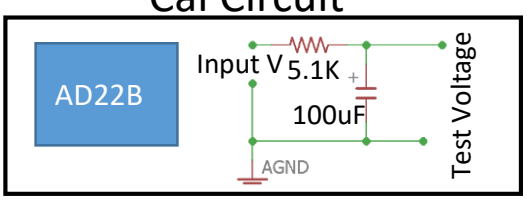
The image above is a 1:1 of the AD22B Shield. You can print this out and use it to layout your assembly and drill mounting holes as needed. V1.1

Additional Specifications

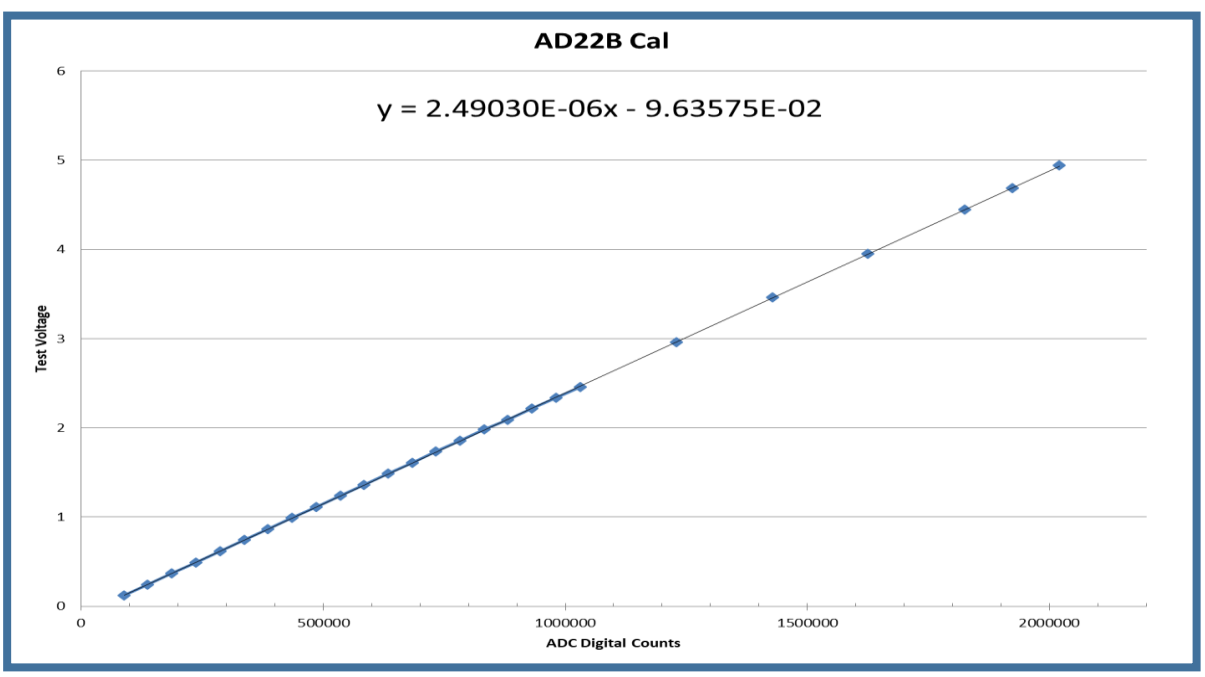
- For 0 to 5V inputs: Input impedance is 1M ohm +/-0.2% and the RC filter is a nominal 0.145 Hz
- For 0 to 2.5V input: Input impedance is >10M ohm and the RC filter is a nominal 30 Hz
- Nominal conversion time is 84mS
- The MCP3550-60 has 21.9 bits of effective resolution as reported by Microchip.
- The optional MCP3553 has a 17mS conversion time but an effective resolution of 20.6 bits as reported by Microchip.
- The voltage reference is the ISL21010-25 in a SOT-3 package.
- The voltage reference is +/-0.006V at 25°C
- The Vref pin (#2) is able to sink/source up to 2.5mA DC. Care is needed; any noise on this pin directly effects the performance of the ADC!
- Vsup voltage can be 3.3V to 5.0V. The supply voltage is filtered with a low pass pi filter for low noise measurement
- The filtered supply voltage and 2.5V ref are available as output pins to power small low power analog sensors.

An example calibration plot is shown below. Your results will vary.

Cal Circuit



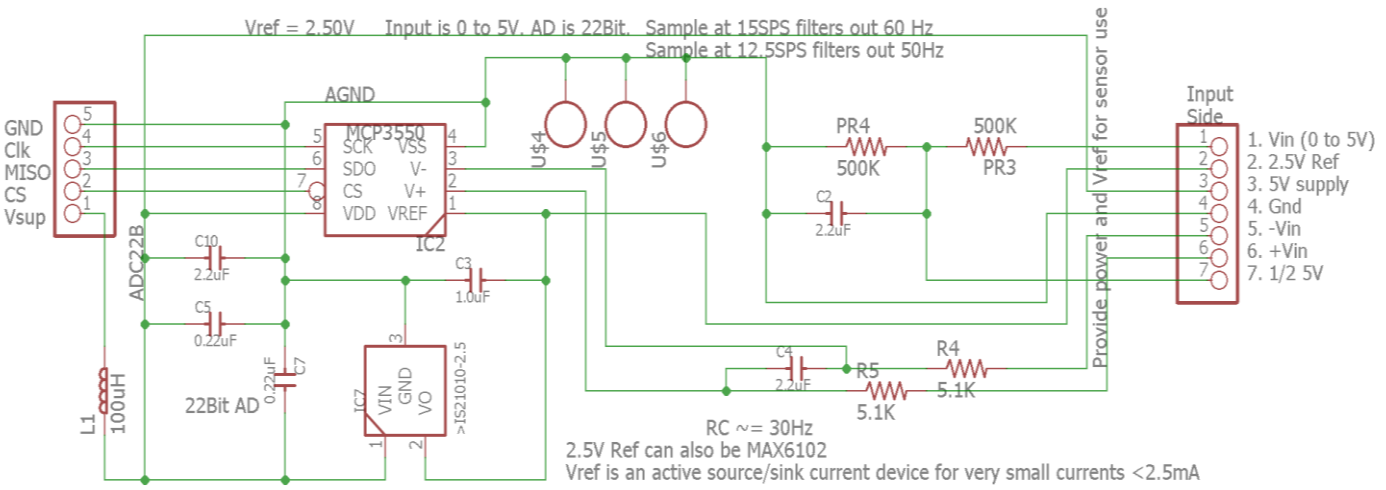
Test AD22B Laboratory Calibration



The Circuit

Digital Input Pins (Arduino Side)

1) Vsup --- 5V (or 3.3V)
2) CS --- Chip Select for SPI
3) MISO --- Master In, Slave Out for SPI
4) CLK --- Clock for SPI
5) GND --- Ground

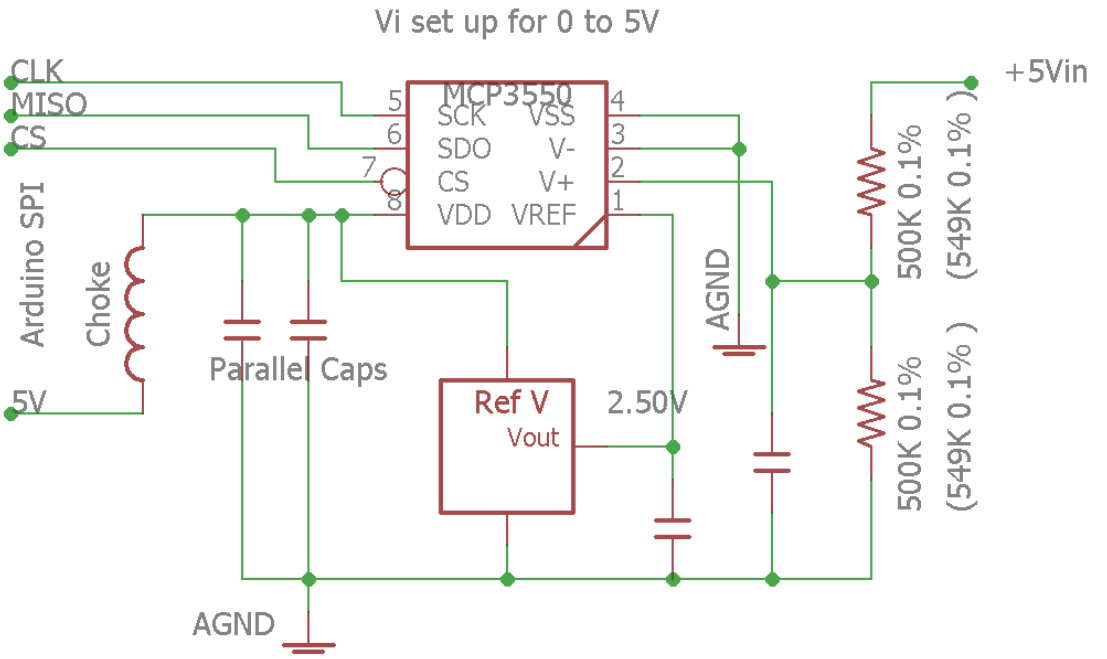


Analog Input Pins (Sensor Side)

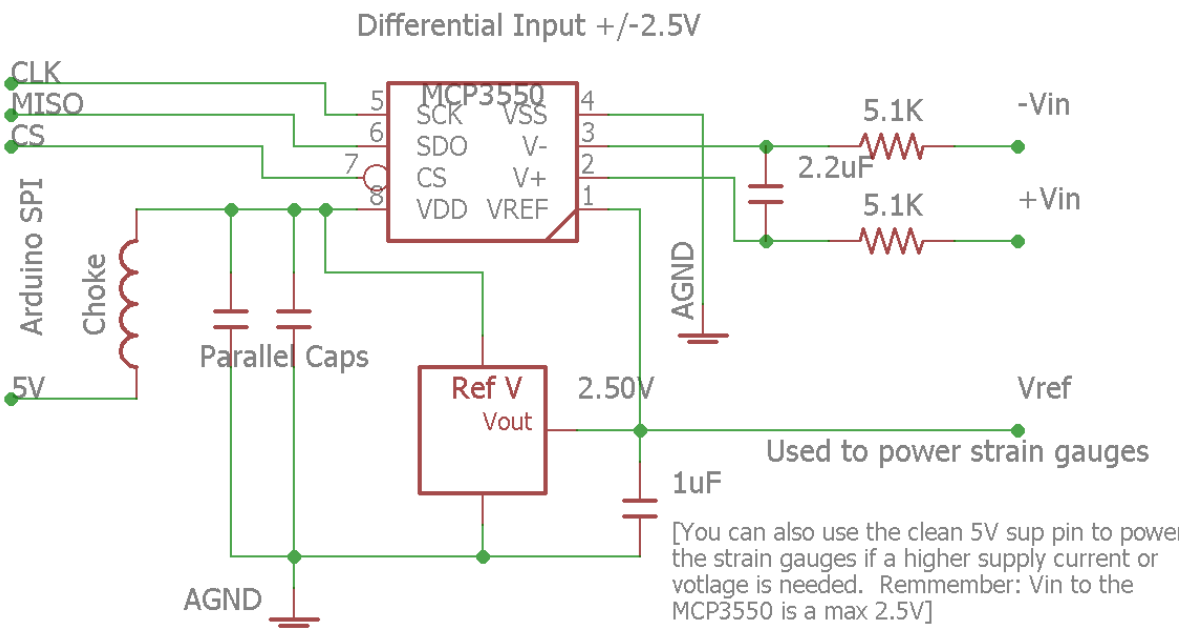
1) +5Vin – Input signal 0V to 5V: Need 2 Jumpers pin 4 to pin 5
2) Vref --- 2.5V Ref DC voltage
3) 5V sup --- Clean 5V DC voltage
4) Gnd --- Ground
5) –Vin --- Used only for differential input otherwise jumper to pin 4 - Gnd
6) +Vin --- Used only for 0 to 2.5V input or differential -/+2.5V
7) ½ 5V --- Used only for +5Vin with jumper to pin6 - +Vin

(Vref and 5V supply are available for your analog sensor circuits. Vref limited to 2mA and 5V sup to 10mA. Keep noise off of Vref!!

General Measurement Circuits



Notes: The input is 1M ohm or greater. This can load down some sensors. The addition of high impedance can lead to increase measurement noise. Jumper are required between analog input pins 4-5 AND 6-7.



Notes: In general, the differential measurement offers the highest resolution. This measurement circuit can directly measure output signals from many strain gage sensors. With a constant current source it can measure ‘resistance’.

The differential input doesn’t use any jumpers. The two inputs –Vin and +Vin must be positive voltage. Measured voltage is = +Vin - -Vin. To get full range, +Vin and –Vin need to be centered at 1.25V. At +Vin = -Vin = 1.25V, ADC counts = 0.

For the 0 to 2.5V input range circuit, jumper pins 4-5. This sets the –Vin = 0V.