

Please download the datasheet of your Analog-To-Digital (ADC) converter chip (<http://www.analog.com/media/en/technical-documentation/data-sheets/16389fg.pdf>) and answer the questions below relating to your ADC's specifications.

1. Explain in your own words how Serial Peripheral Interface (SPI) allows the ADC chip to communicate with the Raspberry Pi (https://en.wikipedia.org/wiki/Serial_Peripheral_Interface)

The ADC chip takes an analog voltage and converts it into a digital signal that can be understood by the Raspberry Pi. The SPI allows for this digital signal to be sent through the MISO (Master Input Slave Output). The Raspberry Pi, in this case being the master, will send data to the ADC through the MOSI (master output slave input) and the CLK (serial clock), the latter determines the rate at which this communication happens.

2. What is the dynamic / input voltage range of the ADC recalling that it is powered from ground to 3.3V?

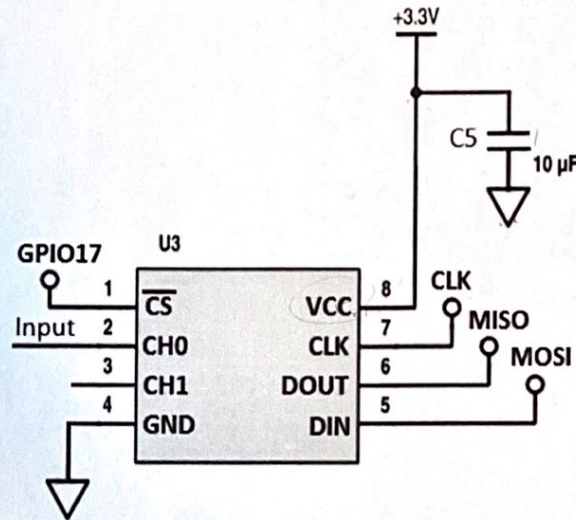
The dynamic range of the ADC is equal to 3.3V which is also the highest voltage the ADC accepts.

3. What is the resolution of the ADC?

$$\text{resolution} = \frac{\text{dynamic range}}{2^{\# \text{ bits}}} = \frac{3.3 \text{ V}}{2^{12}} = 0.000806 \text{ V} = \boxed{0.806 \text{ mV}}$$

4. How do you set the sampling frequency?

The CLK pin determines the rate at which the ADC measures the input analogue and communicates with the Raspberry Pi. This value is set by the "Master", in this case, the Raspberry Pi.



Using the schematic of the ADC, answer the below questions.

5. What is C_5 for?

This capacitor is used to prevent noise from entering the system by bypassing it to ground.

6. Why should C_5 be physically close the ADC on your circuit board?

The C_5 should physically be closer to the ADC on the circuit board to avoid noise.

Now build the circuit above. Connect the GPIO17, CLK, MISO, MOSI to the plastic connector at the lower right portion of your board (now is a good time to solder in the appropriate connector). Submit a picture of your board, ensuring that the appropriate connections are visible and able to be followed.