Understanding ADC Resolution and Voltage Range

ADC Resolution

The range of 0-1023 for a 5V input is a result of the **ADC resolution**. This resolution determines the number of distinct values that the ADC can distinguish. In this case, the ADC has a 10-bit resolution, which means it can distinguish 2^10 = 1024 different values.

Scaling the Range

If you want to measure a voltage higher than 5V, you need to **scale down** the voltage to fit within the ADC's input range. This can be done using a voltage divider circuit.

Voltage Divider: A voltage divider consists of two resistors connected in series. The voltage at the junction of the two resistors is a fraction of the total voltage across them. By adjusting the ratio of the resistors, you can scale down the voltage to a suitable range for the ADC.

Example: If you want to measure a 50V input using a 10-bit ADC, you could use a voltage divider to scale down the voltage to 5V. For example, if you use two resistors with a ratio of 1:9, the voltage at the junction would be 5V when the input is 50V.

Key Points:

- The ADC resolution determines the number of distinct values it can distinguish.
- For voltages higher than the ADC's input range, a voltage divider can be used to scale down the voltage.
- The voltage divider's ratio determines the scaling factor.

By understanding these concepts, you can effectively use ADCs to measure voltages of various ranges.