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General Queries on ADC



[Tendulkar S](#)

[Prodigy_30 points](#)

Community Member

Kindly clarify below mentioned queries.

1. What is the difference between accuracy and resolution of ADC?? If any calculation available pls share with us.
2. How to select ADC for proper input signal range?? if any application notes or calculation available pls share with us.
3. How reference voltage will effect the full scale range of ADC??
4. In ADC, whether internal voltage reference is better than external voltage reference?? Kindly explain.

[over 6 years ago](#)



[Joseph Wu](#) *over 6 years ago*

[TI_Guru*](#) 92995 points

Tendulkar,

1. Resolution usually is a measurement of the noise compared to the full scale range. For example, let's say you are trying to measure an input voltage of 0V with a 24-bit ADC (2^{24} codes). If you take 500 data points and the output data is giving you some noise of about ± 10 codes, our resolution would be some measure of the 20 code uncertainty out of the total number of codes.

Often, we'd describe this as effective number of bits (ENOB). For this case, $\log_2(2^{24}/20) = 20.7$ bits.

For accuracy, would often be a description for any systemic error. This could include offset, gain error, and integral non-linearity error. Sometime noise could be wrapped into this.

2. Generally I'd select the ADC based on the application. It's hard to answer this question, If you could describe what it is you want to design, it would be easier to help you select the ADC.

3. For any ADC, you compare an input signal versus a reference voltage. Often the positive input range is the reference voltage (scaled with gain). If you are in a gain of 1, the ADC measurement range would be $\pm V_{REF}$. If you are in a gain of 128, the ADC measurement range would be $\pm V_{REF}/128$. The reference voltage directly affects the full scale range of the ADC.

Note that there are exceptions to the exact scaling of the reference voltage for the measurement. However, in all cases, the full scale range is determined by the reference voltage.

4. The ADC measurement will be as good as the reference voltage. For all of these devices, the internal reference is capable of making good measurements. However, you'll be able to find external references that are better and worse than the internal reference. My advice would be to look at the specifications in accuracy, drift, and noise to see if the internal reference is good enough for you. Note that the overall accuracy for the reference will directly affect the gain error of the ADC measurement.

Are you looking at one of our ADCs in particular? Again it would help for you to describe what it is you want to build and then we could look at your options.

Joseph Wu

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