25 Spring ECEN 610: Mixed-Signal Interfaces

Lab5: Data Conversion Basics

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<https://github.com/Yu-HaoChen/TAMU_ECEN610_Mixed_signal/tree/main/lab4>

1. A 200mV rms value sinusoidal signal is applied to and ideal 12 bits ADC. The full range peak-to-peak voltage of the ADC is 1.2V. a. Find the SNR of the ADC output. b. Now the input sinusoidal is full range but comes with an additive Gaussian noise with standard deviation of 0.5 V. What is the SNR of the input signal? What is the SNR of the ADC output bits? c. Repeat b assuming that the noise added to the sinewave is uniformly distributed with peak-to-peak value of 1V.

4. A ramp histogram is used to characterize a 4-bit ADC, the following vector is found: 43 115 85 101 122 170 75 146 125 60 95 95 115 40 120 242 I suggest you do this in Matlab: a.) Calculate the DNL and INL b.) What are the peak DNL and INL values? c.) Is this ADC monotonic? Hint: Recall that you use as a reference the straight line that connects the end points of the transfer function provided by the histogram. This is needed to eliminate offset errors and full scale errors. There is a trivial way to eliminate these errors. How?

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5. The end point DNL for a 3-bit ADC is measured to be: DNL: 0 -0.5 0 +0.5 -1 +0.5 +0.5 0 (all numbers in terms of LSB) The ADC exhibits offset and full-scale error: Offset error = +0.5LSB Full scale error = +0.5LSB a) Find the INL for this ADC b) Draw the transfer curve of this ADC.

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