

# EE247 Reader

## Nyquist Rate Data Converters

### Books

R. v. d. Plassche, *CMOS Integrated Analog-to-Digital and Digital-to-Analog Converters*, 2nd ed., Kluwer, 2003

B. Razavi, *Data Conversion System Design*, IEEE Press, 1995.

### Publications

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Data transmission is the physical transfer of data (a digital bitstream) over a communication channel. Examples of such channels are copper wires, optical fibers, wireless communication channels, or data storage devices. Bit rate or bitrate is the number of bits that are transmitted over a communication channel or processed in a computer system per unit of time. Bit rate is usually measured in bits per second (bit/s or bps). Using the Data Transmission Converter Converter. This online unit converter allows quick and accurate conversion between many units of measure, from one system to another. The Unit Conversion page provides a solution for engineers, translators, and for anyone whose activities require working with quantities measured in different units. References Data Converters. Principles of Data Conversion System Design Behzad Razavi IEEE Press, 1995 ISBN 0-7803-1093-4 IEEE order number: PC4465. The Art of Electronics (2nd Edition) Paul Horowitz, Winfield Hill Cambridge University Press, 1989 ISBN 0-5213-7095-7. The Nyquist limit is defined as half of the sampling frequency. The Nyquist limit sets the highest frequency that the system can sample without frequency aliasing. In a sampled data system when the input signal of interest is sampled at a rate slower than the Nyquist limit ( $f_{IN} > 0.5f_{SAMPLE}$ ), the signal is effectively "folded back" into the Nyquist band. The signal thus appears to be at a lower frequency than it actually is. Typical example of Nyquist frequency and rate. They are rarely equal, because that would require over-sampling by a factor of 2 (i.e. 4 times the bandwidth). In signal processing, the Nyquist frequency (or folding frequency), named after Harry Nyquist, is a characteristic of a sampler, which converts a continuous function or signal into a discrete sequence. The Nyquist frequency or folding frequency is half the sampling rate and corresponds to the highest frequency which a sampled data system can reproduce without error.

^ Thomas Zawistowski; Paras Shah. "An Introduction to Sampling Theory". 1 EE382V: Data Converters Course Overview Arjang Hassibi Data Converters: Lecture 1 Spring 2009 A. Hassibi Data Converter: Lecture 1 2 VLSI Data Conversion Circuits Information is increasingly being stored, processed and communicated in digital form. However, much of that digital information is derived from , or must be converted to , signals which are inherently analog . Digital VLSI Systems Sensors & Actuators Audio I/O Imager & Displays Transmission Media Storage Media. 2 A. Hassibi Data Converter: Lecture 1 3 Should We Do "Everything" in Digital? 3. "Understanding Data Converters," Texas Instruments Application Report SLAA013, Mixed-Signal Products, 1995. 4. M. V. Bossche, J. Schoukens, and J. Renneboog, "Dynamic Testing and Diagnostics of A/D Converters," IEEE Transactions on Circuits and Systems, vol. CAS-33, no. 8, Aug. 1986. 27. I. Mehr and L. Singer, "A 500-Msample/s, 6-Bit Nyquist-Rate ADC for Disk-Drive Read-Channel Applications," JSSC July 1999, pp. 912-20. 28. T. B. Cho and P. R. Gray, "A 10 b, 20 Msample/s, 35 mW pipeline A/D converter," IEEE Journal of Solid-State Circuits, vol. 30, pp. 166 - 172, March 1995. 29. C. Mangelsdorf et al, "A 400-MHz Flash Converter with Error Correction," JSSC February 1990, pp. 997-1002.