Application Report
SNOA044C–May 2004–Revised September 2006

D/A Converters Definition of Terms

ABSTRACT

Aperture Jitter: The variation in aperture delay from sample to sample. Aperture jitter shows up as noise at the output.

Crosstalk: The undesired coupling of energy from one channel or path to another.

Differential Nonlinearity (DNL): Ideally, any two adjacent digital codes correspond to output analog voltages that are exactly one LSB apart. Differential non-linearity is a measure of the worst case deviation from the ideal 1 LSB step. For example, a DAC with a 1.5 LSB output change for a 1 LSB digital code change exhibits ½ LSB differential non-linearity. Differential non-linearity may be expressed in fractional bits or as a percentage of full scale. A differential non-linearity more negative than −1 LSB will lead to a non-monotonic transfer function in a DAC.

Digital Feedthrough: The energy feed from the digital inputs (both data and clock lines) to the DAC output.

Feedthrough: See Digital Feedthrough

Full Scale Error: The difference between the output voltage (or current) with full scale input code and the ideal voltage (or current) that should exist with a full scale input code.

Gain Error: The degree to which the slope of a line drawn between zero-scale and full-scale on the input-output transfer curve deviates from the ideal. It is measured as the Full-Scale Error minus the Zero Scale Error.

Gain Error Temperature Coefficient: Change in gain error divided by change in temperature. Usually expressed in parts per million per degree Celsius (ppm/°C).

Glitch Energy: The energy in the output glitch of a DAC when the DAC data register is updated. The net energy under that glitch is the glitch energy. Glitch energy is generally specified in picovolt-seconds.

Integral Nonlinearity (INL) or Linearity Error: Worst case deviation from the line between the two points, which can be the zero-scale and full-scale points (End Point test method) or a line that gives the best results (Best Fit Method). Can be expressed as a percentage of full scale or, more normally, in LSB.

LSB (Least-Significant Bit): In a binary coded system this is the bit that carries the smallest value or weight. Its value is the full scale voltage (or current) divided by 2^n, where n is the resolution of the converter.

Monotonicity: A monotonic function has a slope whose sign does not change. A monotonic DAC has an output that changes in the same direction (or remains constant) for each increase in the input code.

MSB (Most Significant Bit): In a binary coded system this is the bit that has the largest value or weight. Its value is one half of full scale.

Multiplying Bandwidth: The frequency at which the output amplitude of a DAC falls 3 dB below the the level of the input sine wave at the reference input with a full-scale code loaded into the DAC.

Multiplying DAC: A DAC that can accommodate a wide range of reference voltages or currents, which are allowed to be an AC signal.

Offset Error: See Zero Code Error

Output (Voltage) Compliance: The output voltage range that can be present at the current output pin(s) of a DAC and that DAC maintain rated accuracy.

Power Supply Rejection (Power Supply Sensitivity): The sensitivity of a converter output to changes in the DC power supply voltages.

Resolution: the smallest analog increment corresponding to a 1 LSB converter code change. For converters, resolution is normally expressed in bits, where the number of analog levels is equal to 2^n, where "n" is the number of bits for the converter.

Settling Time: The time from a change in the input code until the DAC's output signal enters and remains within the *specified tolerance* of the final value. The specified tolerance is often, but does not necessarily have to be, ±½ LSB

Wake-Up Time: The time it takes for the device to exit the power down mode. It is the time from the wake-up signal edge to when the output stabilizes at its final value with a constant code loaded into the DAC.

Zero Code Error: The difference between the actual and ideal DAC output voltage or current that exists when the digital code loaded into the DAC is zero. Offset error is usually expressed in LSBs or Volts.

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