Basic DAC Techniques

Digital systems are used in ever more applications because of their increasingly efficient, reliable, and economical operation. With the development of micro processor, data processing has become an integral part of various systems. A digital to analog converter, or D/A, is a component that takes a digital word and converts it to a corresponding analog voltage. It has the opposite function of an A/D converter D/A is only capable of producing a quantized representation of an analog voltage, not an infinite range of output voltages.

The application will almost always dictate the selection of the D/A converter, leaving the designer the task of interfacing that converter with the output load.

A D/A converter interface with a buffer op amp. Most D/A converters are manufactured with a process that is incompatible with op amps. Therefore, the op amp cannot be manufactured on the same IC. It must be external, and its characteristics are an integral part of the conversion process. In most cases, the data sheet will make a recommendation for the selection of a buffer op amp. Follow the recommendation, unless there is a compelling reason not to do so. Performance can be improved only if you know exactly what op amp specifications need to be optimized.

Signal conditioning — low pass filtering, DC offsets, and power stages — should all be placed after the recommended op amp buffer. Do not attempt to combine these functions with the buffer unless you are an experienced designer with a good grasp of all of the applications.

It is important to understand the D/A converter and its specifications before discussing interfaces.

D/A converters are available in several types, the most common of which is the resistor ladder type. There are several variations on the resistor ladder technique, with the R/2R configuration being the most common.

Types of Digital to analog Converters:

1. Digital to analog converter with binary weighted resistors
2. Digital to analog converter with R and 2R resistors
3. Monolithic/hybrid digital to analog converter.

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