

## Software Configurable, 12-Bit Dual-Channel, Unipolar/Bipolar Voltage Output Using the **AD5722R** DAC

### CIRCUIT FUNCTION AND BENEFITS

This circuit provides unipolar and bipolar data conversion using the **AD5722R**, a dual, 12-bit, serial input, unipolar/bipolar voltage output DAC. The only external components needed for this 12-bit DAC are decoupling capacitors on the supply pins and reference input, leading to savings in cost and board space. This circuit is well suited for closed-loop servo control applications.

### CIRCUIT DESCRIPTION

The **AD5722R** is a digital-to-analog converter (DAC) that offers guaranteed 12-bit monotonicity, integral nonlinearity (INL) of  $\pm 0.5$  LSB, 0.1% total unadjusted error (TUE), and 10  $\mu$ s settling time. The **AD5722R** also integrates a 2.5 V, 5 ppm/ $^{\circ}$ C voltage reference, reference buffers, and output amplifiers. This leads to further savings in both cost and board space. Performance is guaranteed over the following supply voltage ranges: AVDD supply range from +4.5 V to +16.5 V and AVSS supply range from -4.5 V to -16.5 V. AVSS can be connected to 0 V if only unipolar outputs are required. The output range can be individually programmed for each output channel with these options: 0 V to +5 V, 0 V to +10 V, 0 V to +10.8 V, -5 V to +5 V, -10 V to +10 V, and -10.8 V to +10.8 V. The input coding is user selectable twos complement or offset binary for a bipolar output (depending on the state of the BIN/2sCOMP pin). Coding is straight binary for a unipolar output. Figure 2 shows that the typical output error of this circuit at 25 $^{\circ}$ C ambient temperature is less than 0.07 %FSR.

The circuit must be constructed on a multilayer printed circuit board (PCB) with a large area ground plane. Proper layout, grounding, and decoupling techniques must be used to achieve optimum performance (see [MT-031 Tutorial, Grounding Data Converters and Solving the Mystery of AGND and DGND](#) and [MT-101 Tutorial, Decoupling Techniques](#)).

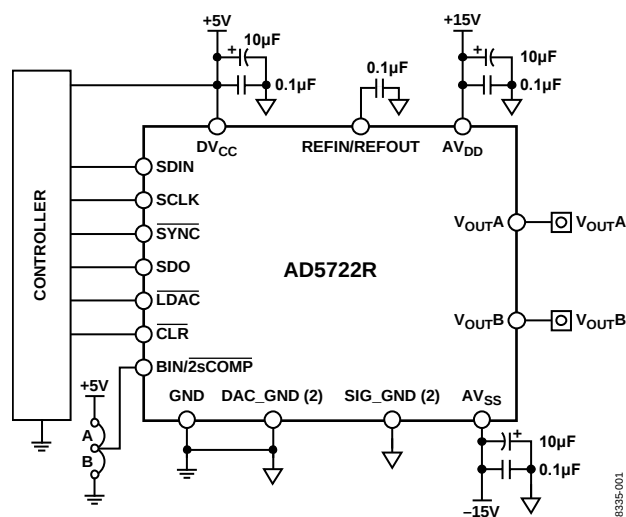


Figure 1. Unipolar/Bipolar Configuration for the **AD5722R** DAC

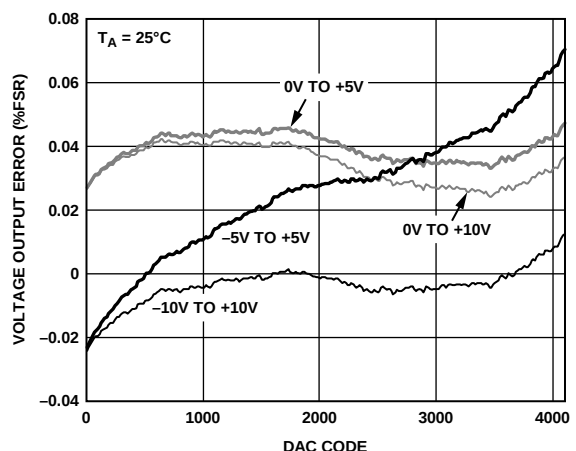


Figure 2. Voltage Output Error

**LEARN MORE**

Kester, Walt. 2005. *The Data Conversion Handbook*. Analog Devices. Chapters 3 and 7.

MT-015 Tutorial, *Basic DAC Architectures II: Binary DACs*. Analog Devices.

MT-031 Tutorial, *Grounding Data Converters and Solving the Mystery of AGND and DGND*. Analog Devices.

MT-101 Tutorial, *Decoupling Techniques*. Analog Devices.

Voltage Reference Wizard Design Tool.

**Data Sheets and Evaluation Boards**

[AD5722R Data Sheet](#).

[AD5754R Evaluation Board \(Compatible with AD5722R\)](#).

**REVISION HISTORY**

**4/13—Rev. 0 to Rev. A**

Document Title Changed from CN-0091 to AN-1198..... Universal

**7/09—Revision 0: Initial Version**