ANALOG DEVICES

Circuit Note
CN-0092

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Devices Connected/Referenced	
AD5752	Complete, Dual, 16-Bit, Unipolar/Bipolar Voltage Output DAC
REF192	Precision 2.5V Voltage Reference

Software Configurable 16-Bit Dual-Channel Unipolar/Bipolar Voltage Output Using the AD5752 DAC

CIRCUIT FUNCTION AND BENEFITS

This circuit provides unipolar and bipolar data conversion using the AD5752BREZ, a dual, 16-bit, serial input, unipolar/bipolar voltage output DAC and the REF192ESZ precision 2.5 V voltage reference. The only other external components needed for this 16-bit DAC circuit 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 AD5752 is a digital-to-analog converter that offers guaranteed 16-bit monotonicity, integral nonlinearity (INL) of ±16 LSB, 0.1% total unadjusted error (TUE), and 10 µs settling time. The AD5752 also integrates reference buffers and output amplifiers, which leads to further savings in both cost and board space. Performance is guaranteed over the following supply voltage ranges: AV_{DD} 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.

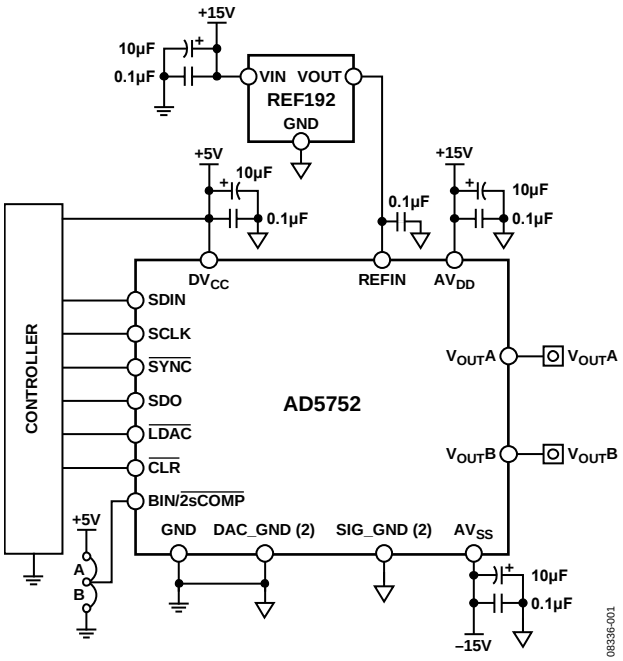

Figure 1. Unipolar/Bipolar Configuration for the AD5752 DAC (Simplified Schematic)

Rev. 0

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The output range can be individually programmed for each channel output 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 2's 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°C ambient temperature is less than 0.06 %FSR.

The circuit must be constructed on a multilayer PC board 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*).

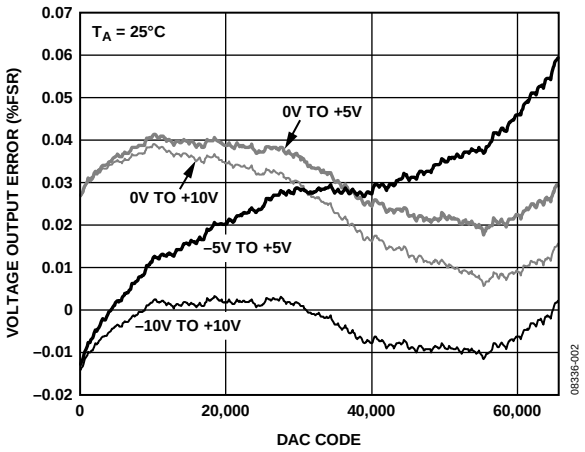

Figure 2. Voltage Output Error

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

AD5752 Data Sheet.

REF192 Data Sheet.

AD5754R Evaluation Board (Compatible with AD5752).

REVISION HISTORY

7/09—Revision 0: Initial Version