

利用 AD5422 提供 16 位电压输出和 4 mA 至 20 mA 输出简化解决方案

电路功能与优势

本电路利用单通道、16 位、串行输入、单极性/双极性电压、4 mA 至 20 mA 电流源 DAC AD5422, 提供单极性/双极性电压和 4 mA 至 20 mA 输出。它只需用产品 AD5422, 所需外部元件只有电源引脚和基准输入上的去耦电容, 以及用于开漏故障输出的上拉电阻。当电流输出端丧失兼容电压或 AD5422 温度过高时, 开漏故障输出会予以警示。这款解决方案具有很高的集成度, 可节省成本和电路板空间。本电路非常适合工业控制应用中的可编程逻辑控制器(PLC)和分布式控制系统(DCS)。

电路描述

AD5422 是一款低成本、精密、高度集成的 16 位数模转换器, 提供可编程电流源和可编程电压输出, 针对工业过程控制应用的要求而设计。电压输出范围可通过编程设置为 0 V 至 +5 V、0 V 至 +10 V、-5 V 至 +5 V 或 -10 V 至 +10 V。电流输出通过一个独立的引脚访问, 可通过编程设置为 4 mA 至 20 mA、0 mA 至 20 mA 或 0 mA 至 24 mA。AD5422 内置一个 5 V、10 ppm/°C (最大值) 基准电压源, 从而可以进一步节省成本和电路板空间。额定工作电压为: AV_{DD} 电源电压最高达 24 V, AV_{SS} 电源电压最高达 -24 V。不过, AD5422 能够以最高 40 V 的 AV_{DD} 电源电压工作。该器件含有 4.5 V 片内稳压输出 (DV_{CC} 引脚), 能够提供最大 5 mA 源电流。这可以用作上拉电阻的端电极, 或者为数字电路供电, 从而无需产生逻辑电源电压。

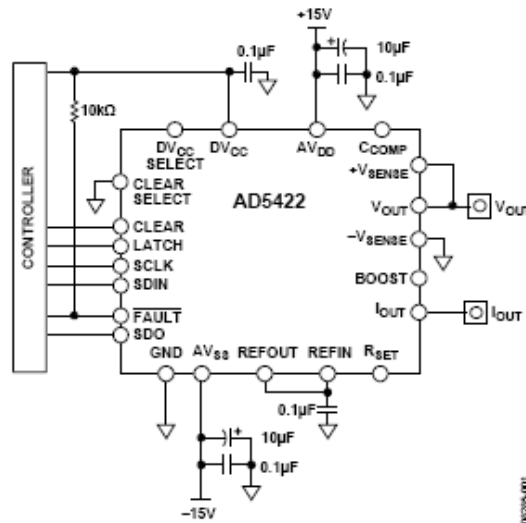


图 1. AD5422 的基本连接 (原理示意图)

Rev.0

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One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113

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图2和图3显示，本电路在25°C环境温度时的电流输出精度和电压输出精度典型值分别为0.016%和0.012%。

本电路必须构建在具有较大面积接地层的多层电路板上。为实现最佳性能，必须采用适当的布局、接地和去耦技术（请参考教程MT-031—“实现数据转换器的接地并解开AGND和DGND的迷团”，以及教程MT-101—“去耦技术”）。

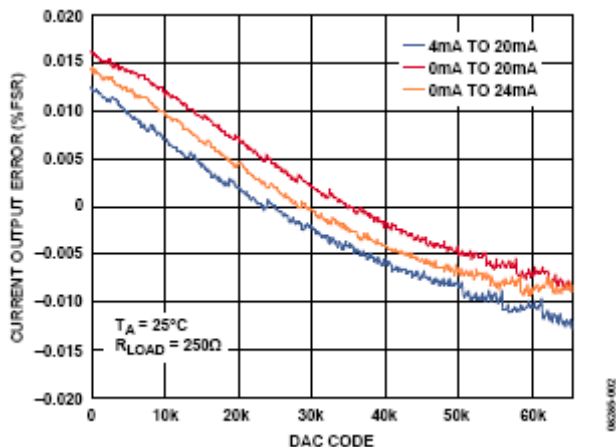


图2. 电流输出精度

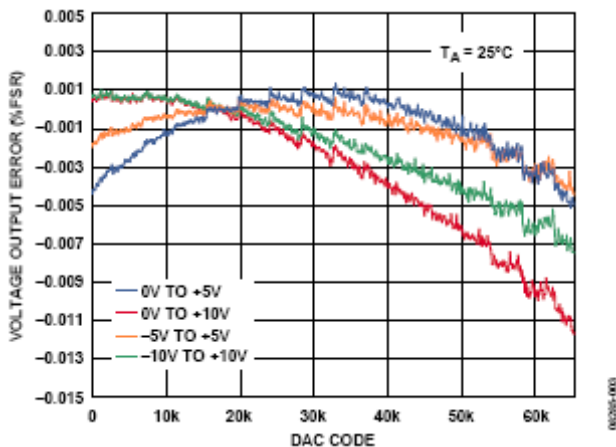


图3. 电压输出精度

进一步阅读

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.

数据手册和评估板

AD5422 Data Sheet.

AD5422 Evaluation Board.

修订历史

7/09—Revision 0: Initial Version

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