



利用 ADI 公司产品进行电路设计
放心运用这些配套产品迅速完成设计。
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连接/参考器件

AD5764	完整的四通道、16 位、高精度 DAC
ADR02	5.0 V 精密基准电压源

利用 AD5764 DAC 实现高精度、双极性电压输出数模转换

电路功能与优势

本电路采用四通道、16 位、串行输入、双极性电压输出 DAC AD5764, 可提供高精度、双极性数据转换。它利用精密基准电压源 ADR02 在整个工作温度范围内实现最佳 DAC 性能。该 16 位精密 DAC 所需的外部器件只有基准电压源、电源引脚和基准输入上的去耦电容以及可选的短路电流设置电阻, 从而可节省成本和电路板空间。本电路非常适合闭环伺服控制和开环控制应用。

电路描述

AD5764 是一款高性能数模转换器, 可保证单调性, 积分非线性(INL)误差为 ± 1 LSB (C 级器件), 噪声低, 建立时间为 10 μ s。在较宽的工作电压范围内, 保证具有额定性能。AV_{DD} 电源电压范围为 +11.4 V 至 +16.5 V, AV_{SS} 工作电压范围为 -11.4 V 至 -16.5 V, 标称满量程输出电压范围为 ± 10 V。

为使该 DAC 在整个工作温度范围内达到最佳性能, 必须使用精密基准电压源。AD5764 内置基准电压源缓冲器, 因而无需外部正负基准电压源及相关的缓冲器, 这样便进一步节省了成本和电路板空间。因为基准输入 (REFAB、REFCD) 上施加的电压用来产生 DAC 内核所用的内部缓冲正负基准电压, 所以外部基准电压的任何误差均会通过该器件的输出反映出来。

针对高精度应用选择基准电压源时, 需要考虑四种可能的误差源: 初始精度、输出电压的温度系数、长期漂移和输出电压噪声。表 1 列出了 ADI 公司的其它 5 V 精密基准电压源候选产品及其特性。

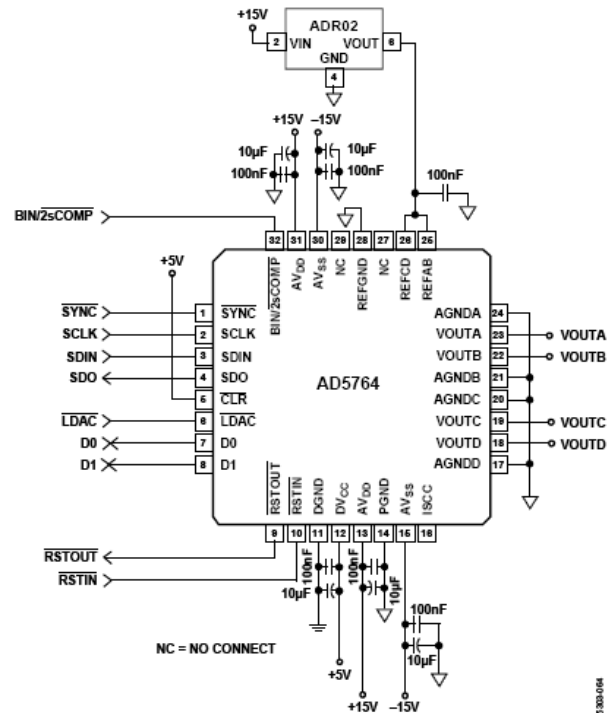


图 1. 采用精密基准电压源的 AD5764 DAC 高精度、双极性配置

在任何注重精度的电路中, 精心考虑电源和接地回路布局有助于确保达到额定性能。安装 AD5764 所用的 PCB 必须采用模拟与数字部分的分离设计, 并限制在电路板的一定区域内。如果 AD5764 所在系统中有多个器件要求 AGND 至 DGND 连接, 则只能在一个点进行连接。星形接地点尽可能靠近器件。AD5764 的每个电源上必须有足够大的旁路电容 10 μ F, 与 0.1 μ F 电容并联, 并且尽可能靠近封装, 最好是正对着该

Rev.A

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表 1：精密基准电压源特性

产品型号	初始精度 (最大值, mV)	长期漂移 (典型值, ppm)	温度漂移 (最大值, ppm/°C)	0.1 Hz 至 10 Hz 噪声 (典型值, μ V 峰峰值)
ADR435B	± 2	40	3	8
ADR425B	± 1	50	3	3.4
ADR02B	± 3	50	3	10
ADR395B	± 5	50	9	8
AD586T	± 2.5	15	10	4

串联电阻(ESR)和低有效串联电感(ESI),如高频时提供低阻抗接地路径的普通陶瓷型电容,以便处理内部逻辑开关所引起的瞬态电流。

AD5764的电源走线必须尽可能宽,以提供低阻抗路径,并减小电源线路上的突波效应。时钟等快速开关信号必须利用数字地屏蔽起来,以免向电路板上的其它器件辐射噪声,并且绝不靠近基准输入。SDIN线路与SCLK线路之间布设接地线路有助于降低二者之间的串扰(多层电路板上不需要,因为它有独立的接地层;不过,接地线路有助于分开不同线路)。基准输入上的噪声必须降至最低,因为这种噪声会被耦合至DAC输出。应避免数字信号与模拟信号交叠。电路板相反两侧上的走线必须彼此垂直,这样有助于减小电路板上的馈通效应。推荐使用微带线技术,但这种技术对于双面电路板未必始终可行。采用这种技术时,电路板的元件侧专用于接地层,信号走线则布设在焊接侧。电路板至少需要 4 层才能实现最佳布局和性能:一个接地层、一个电源层和两个信号层。

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

AD5764 Data Sheet.

AD5764 Evaluation Board.

ADR02 Data Sheet.

修订历史

5/09—Rev. 0 to Rev. A

Updated Format Universal

10/08—Revision 0: Initial Version

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