

TITLE : 4-bit R-2R Ladder Digital-to-Analog Converter

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PROBLEM STATEMENT:

Design and implement an R-2R Ladder Digital-to-Analog Converter (DAC) that converts digital input signals into accurate analog output voltages with minimal power consumption, reduced non-linearity, and improved resolution. The system should ensure reliable digital-to-analog conversion for applications in communication, instrumentation, and signal processing.

ABSTRACT:

The R-2R Ladder Digital-to-Analog Converter (DAC) is one of the simplest and most effective methods for generating analog signals from digital inputs. This project focuses on the design and simulation of an R-2R Ladder DAC using resistor networks and an operational amplifier to achieve accurate and stable analog output. The R-2R architecture is chosen due to its simplicity, scalability, and low power consumption compared to weighted resistor DACs. Simulation validates the circuit's linearity, resolution, and efficiency, confirming its applicability for real-time digital-to-analog conversion in modern electronic systems.

PROPOSED CIRCUIT:

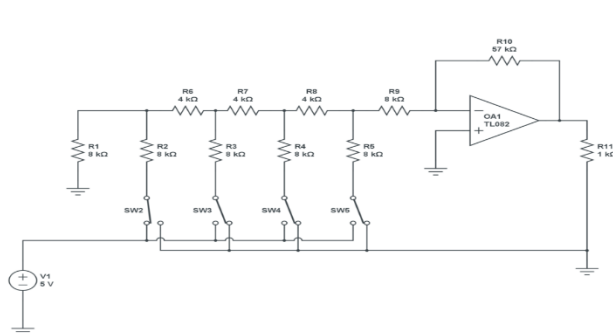


Fig 1: Implementation of 4-bit R-2R DAC

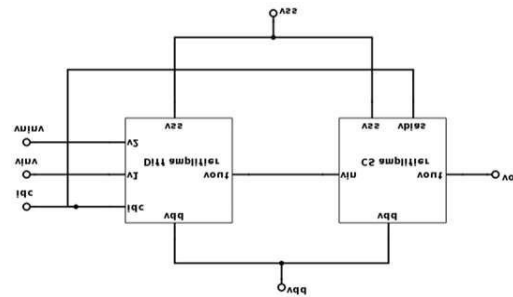


Fig 2: Schematic of op-amp

SOURCE/REFERENCES:

- 1) A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 7th Edition, Oxford University Press, 2014.
- 2) R. L. Geiger, P. E. Allen, and N. R. Strader, *VLSI Design Techniques for Analog and Digital Circuits*, McGraw-Hill, 1990.
- 3) Alan Wolke, "Tutorial: Digital to Analog Conversion – The R-2R DAC," *All About Circuits*, May 2013.