



Digital version

ENGS152 Circuits Lab Section B

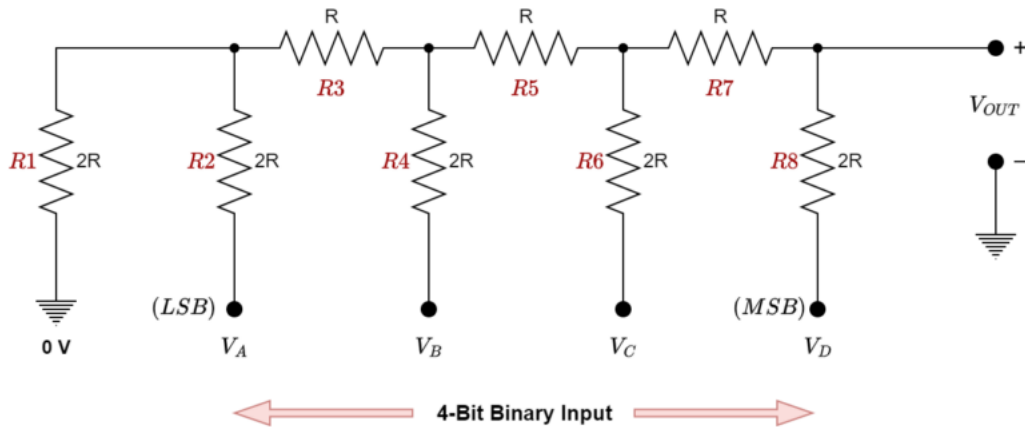
Basic 4 bit DAC analysis in LTspice

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1 Introduction

A Digital to Analogue converter is used to convert digital signals into analogue signals. One of the basic designs for a DAC consists of two resistors, one of has twice the resistance of the other. The basic schematic is:



The points V_A to V_D are connected to either source voltage or ground, depending if that bit is a 1 or a 0. If we consider the case that all resistors are connected to supply voltage, we get that the total resistance is $\frac{256}{85}R \approx 3R$. If we use $0.25W$ resistors, the minimum resistance can be calculated by the formula $P = \frac{V^2}{R}$, which gives $R_{min} \approx 33\Omega$. However, to minimize the current draw, a low resistance of $R = 1k\Omega$ was used. Therefore, the maximum current is $\approx 1.67mA$.

2 Circuits and simulations

Two 4-bit DAC circuits were simulated, with a supply voltage of $5V$. One to convert the binary value of 0100 to the analogue $1.25V$, and the other from 1010 to $3.125V$.

