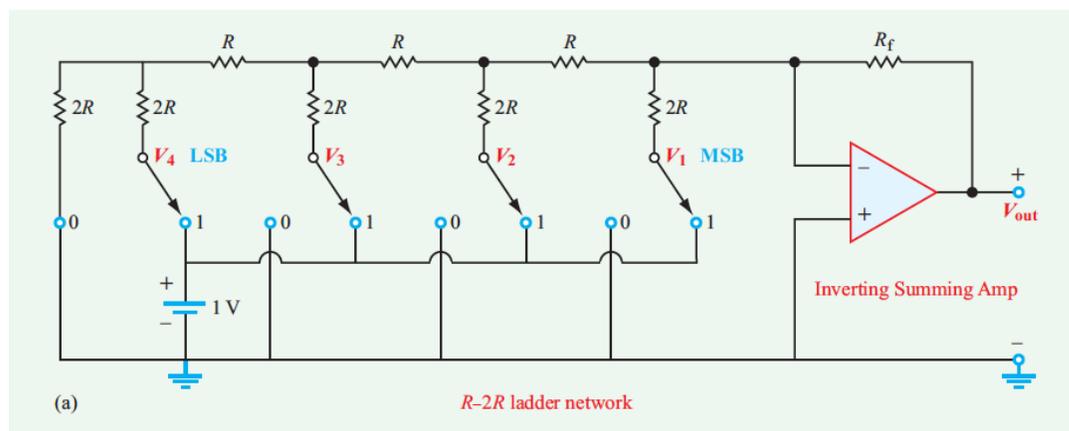
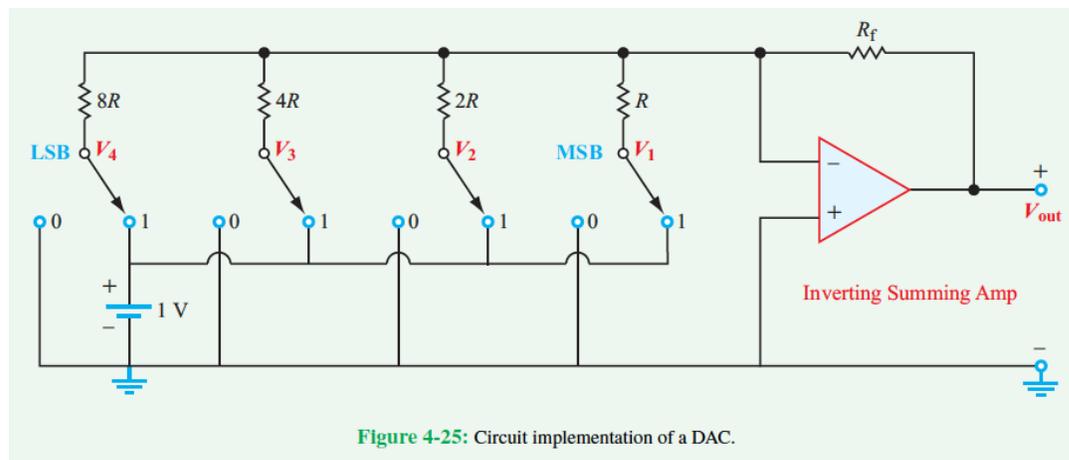


Concept Question 4-19: What is the advantage of the $R-2R$ ladder (Fig. 4-26) over the traditional DAC (Fig. 4-25)?



The circuit in Fig. 4-26(a) offers an alternative approach to realizing digital-to-analog conversion of a 4-bit signal. It is called an $R-2R$ ladder, because all of the resistors of its input circuit have values of R or $2R$, thereby limiting the input resistance seen by the dc source to a 2 : 1 range no matter how many bits are contained in the digital sequence. This is in contrast with the DAC of Fig. 4-25, whose input resistance range is dependent on the number of bits: 8 : 1 for a 4-bit converter, and 128 : 1 for an 8-bit converter. Additionally, circuit performance and precision depend on resistor tolerance and are superior when fewer groups of resistors are involved in the input circuit. Resistors fabricated in the same production process are likely to exhibit less variability among them than resistors fabricated by different processes.