3bit Digitally Controlled PWM Generator using eSim

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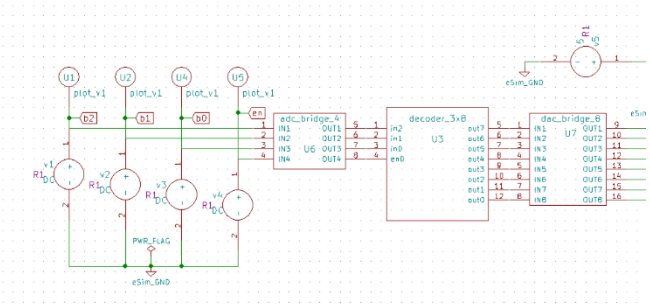
***Abstract*— In this paper, I've designed and implemented 3bit Digitally Controlled PWM Generator using eSim, ngspice, NGHDL, MakerChip. In this design, combination of digital and analog signal was used, making it a mixed signal design. If the circuit given input in 3bit binary, it would produce PWM according to the input. My design uses a combination of 3:8 decoder, MOSFETs, and OpAmps.**

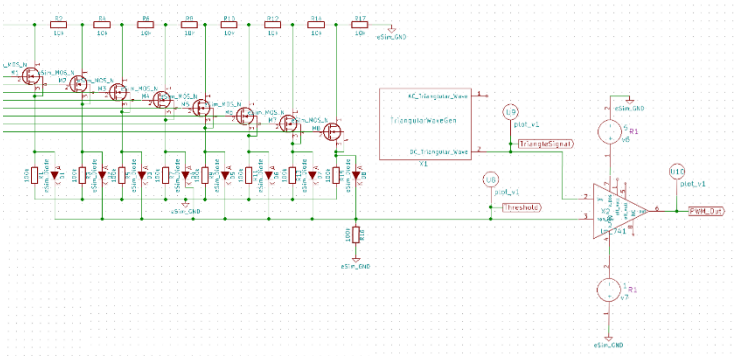
Keywords*— *mixed signal, HDL, PWM

1. Reference Circuit Details

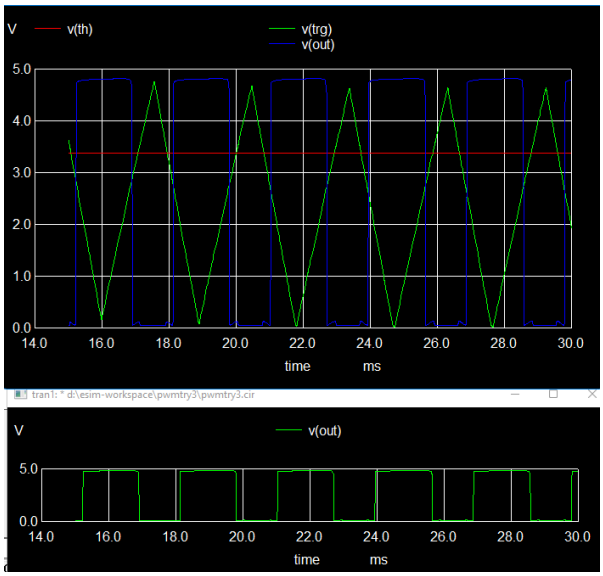
Pulse Width Modulation(PWM) is a method of reducing the average power delivered by an electrical signal by effectively chopping it up into discrete parts. My design for digitally controlled PWM generator, I'll use components like decoder, MOSFETs, and OpAmps in combination with a circuit to generate a triangular wave to compare with, which in turn give PWM. Since, the input is 3bit, there is 8 possible combination of input which will give 8 possible outputs. The 3bit input is given to decoder which given corresponding decimal form output which passes the value to a comparator which produces the expected PWM.

2. Implemented Circuit





3. Reference Waveform



4. References

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[2] Yang, HR., Yoon, K.S. Digitally controlled PWM buck converter employing counter and VCOs. Analog Integr Circ Sig Process 109, 261–269 (2021). https://doi.org/10.1007/s10470-021-01939-3.