西安電子科技大學
XIDIAN UNIVERSITY

Integrated DC-DC Converter

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Topic Requirements

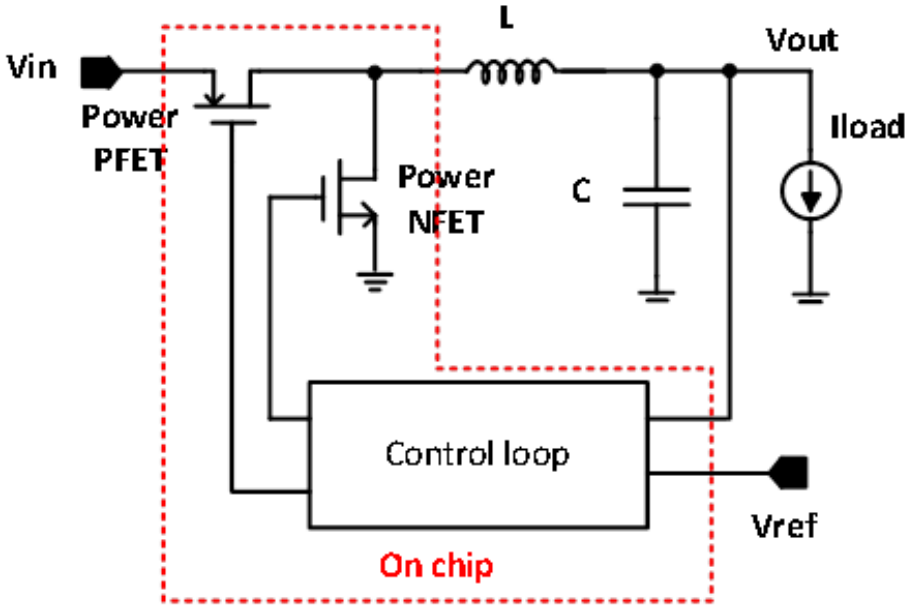

Figure 1: architectual of this design

- Could convert the Vin(2.5V-5V) into a fixed Vout(1.8V)
- Using the voltage mode to achieve loop control
- Using PID compensation to achieve 1MHz system unity gain bandwidth (Vin=3.6V, Iload = 300mA)

Voltage Control Model

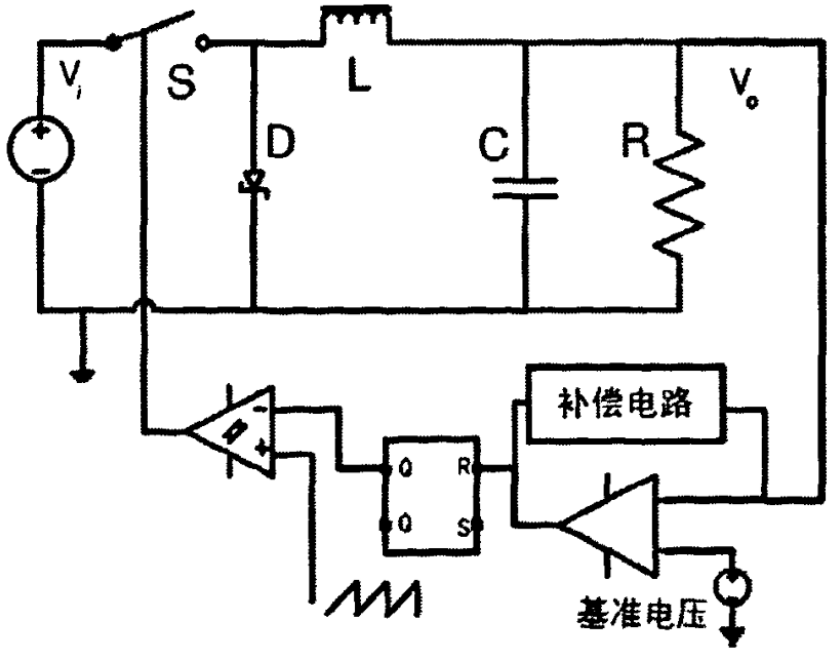

Figure 2: diagram of voltage control model

What need to be done:

- Realize a high speed comparator
- Realize a hign gain operational amplifier

High Speed Comparator

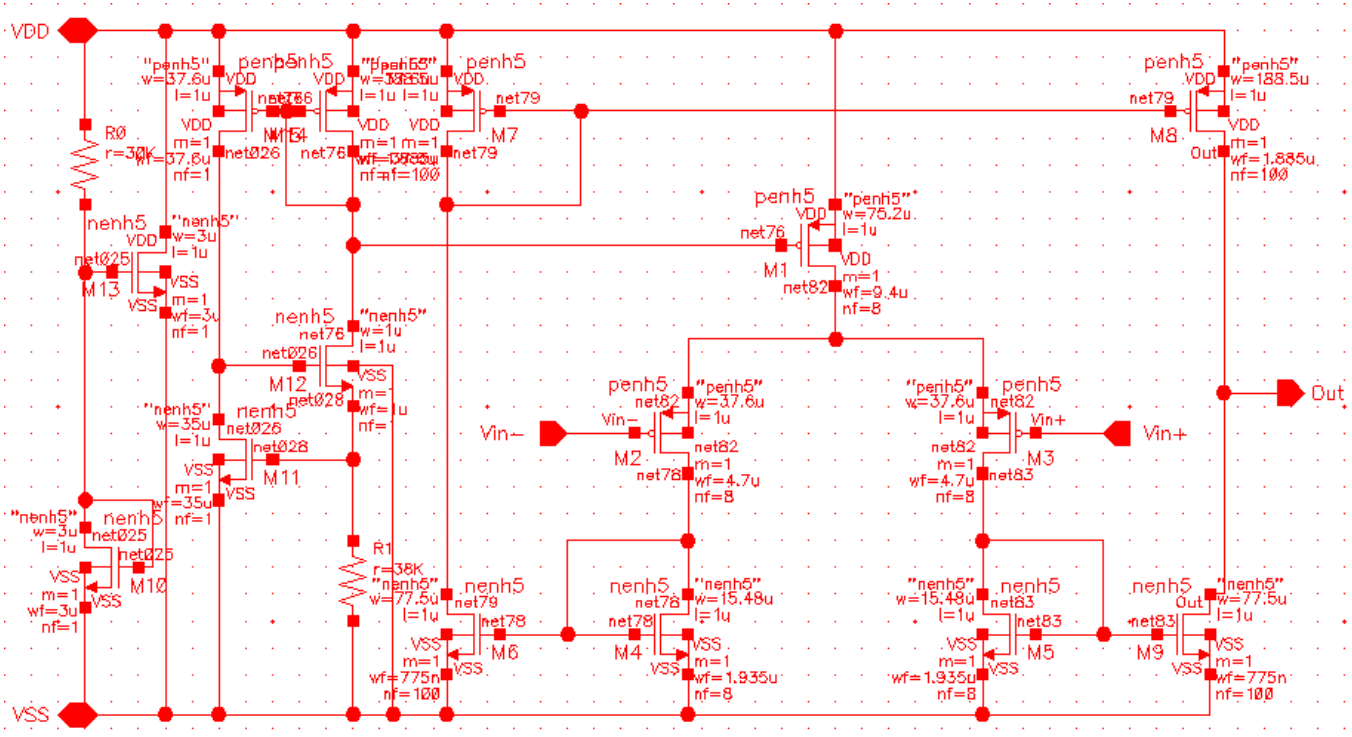

Figure 3: schematic of comparator

- It's easy because it do not need compensation
- Large current can enhance voltage swing

High Speed Comparator

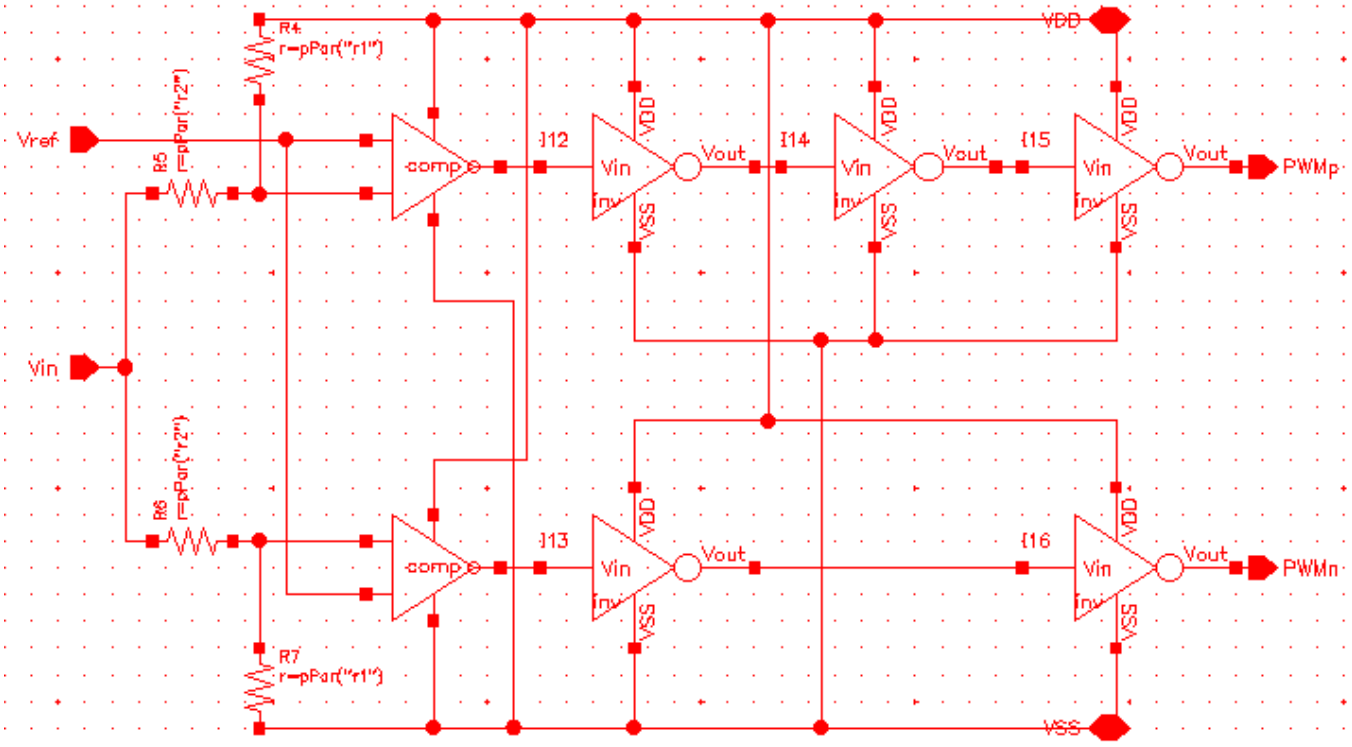

Figure 4: schematic of deadtime generator

- It's realized a schmidt trigger using comparator
- Deadtime is different when the value of r1/r2 varies

High Speed Comparator

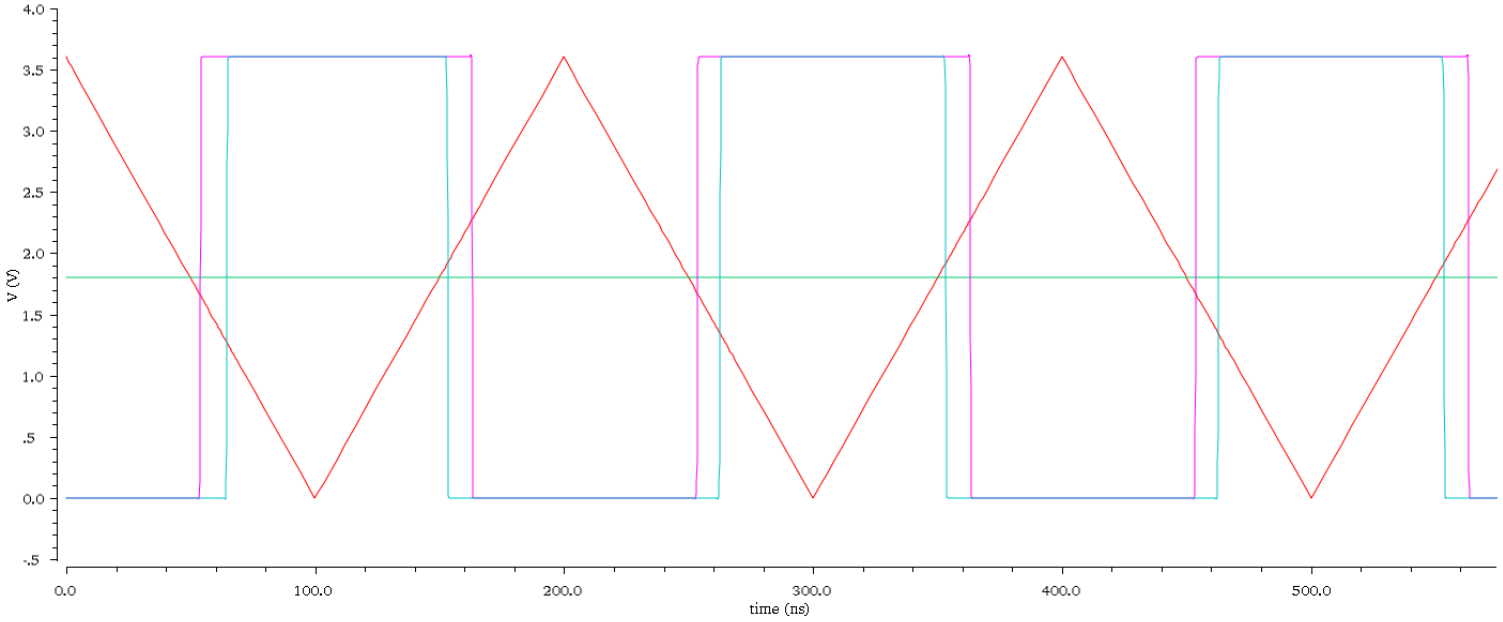

Figure 5: waves of deadtime generator simulation

- The circuit can generate waves that we want
- There is nonideal surge voltage hen it drives power MOSFET

Error Amplifier

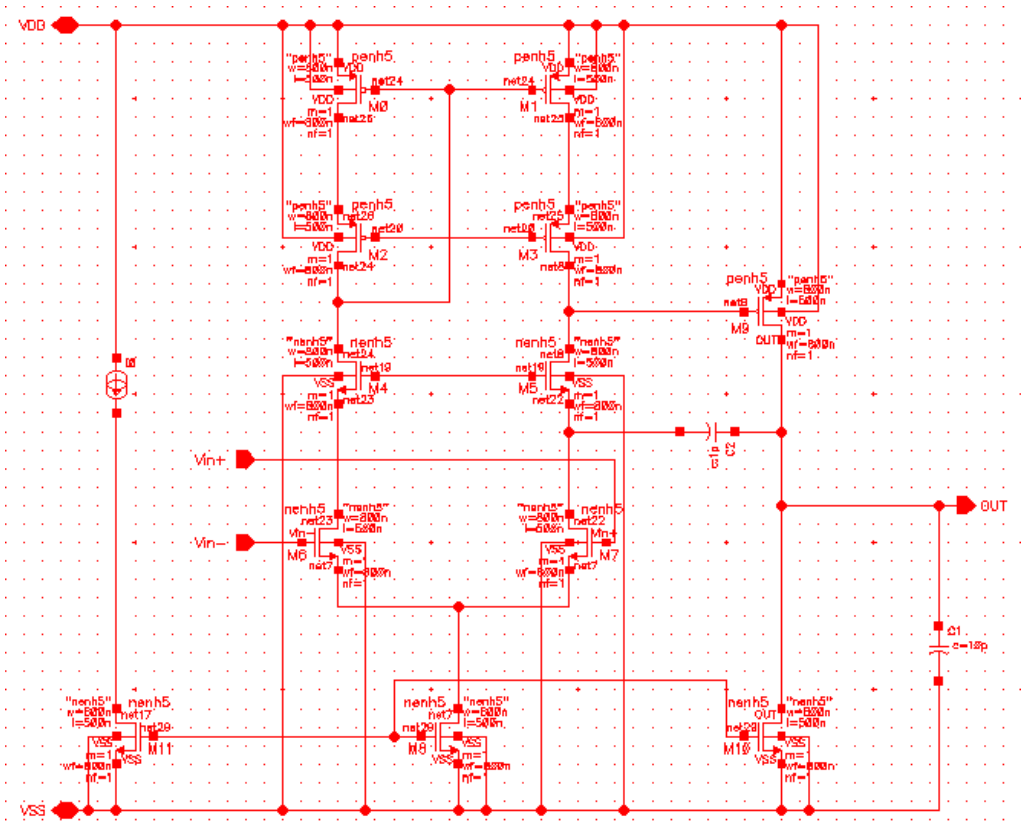

Figure 6: schematic of operational amplifier

Problems:

- Why it can work without a DC operation point?
- Why an EA have different simulation results when Vin differs

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THANK YOU!