EE517: ANALOG IC DESIGN

Design and analysis of Bandgap Voltage reference circuit

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1 Objective

To Design a Bandgap voltage reference circuit with Vref = 1.2v with variation less than 2mV for the temperature range 400 to 1250C in 180nm technology.

2 Design

2.1 Schematics

2.1.1 Circuit diagrams

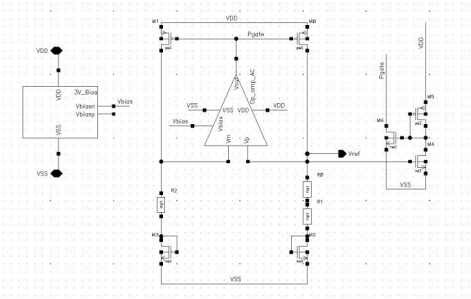

Figure 1: BGR Schematic

2.2 Waveforms

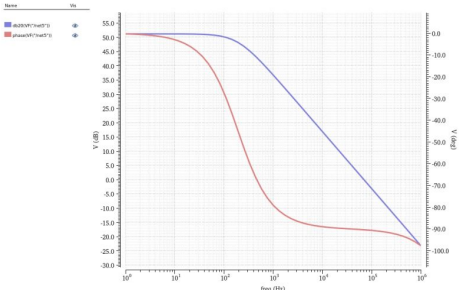

Figure 2: Amplifier response

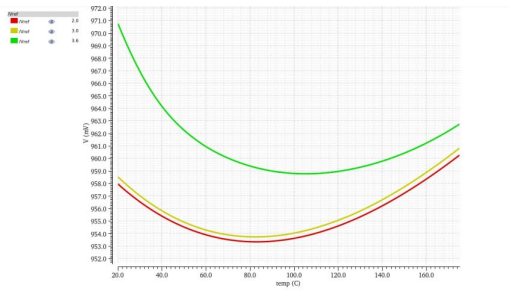

Figure 3: Vref Vs Temperature sweep

2.3 Observations

Vdd	Vref	Max diff
2	2.6	7.1
2.8	2.8	7.2
3.6	-7.4	11.5

Table 1: Observed Vref with Vdd sweep

Temp	Vref	Max Diff
20	12.6	12.6
97.5	5.4	5.4

Table 2: Characterization of Vref with Temperature swing

3 Conclusions

The results were obtained through simulations after removing parasitic components from the final configuration. As previously claimed, the final layout's parasitics had no significant impact on circuit performance. The data indicates that the reference voltage changes by a maximum of 1.2 % of the nominal value across the temperature range and 1.3 % over the supply voltage range. The data indicates that the circuit

is more tolerant of fluctuations in supply voltage as it approaches its maximum working temperature.