CAD 3: Ring Oscillator
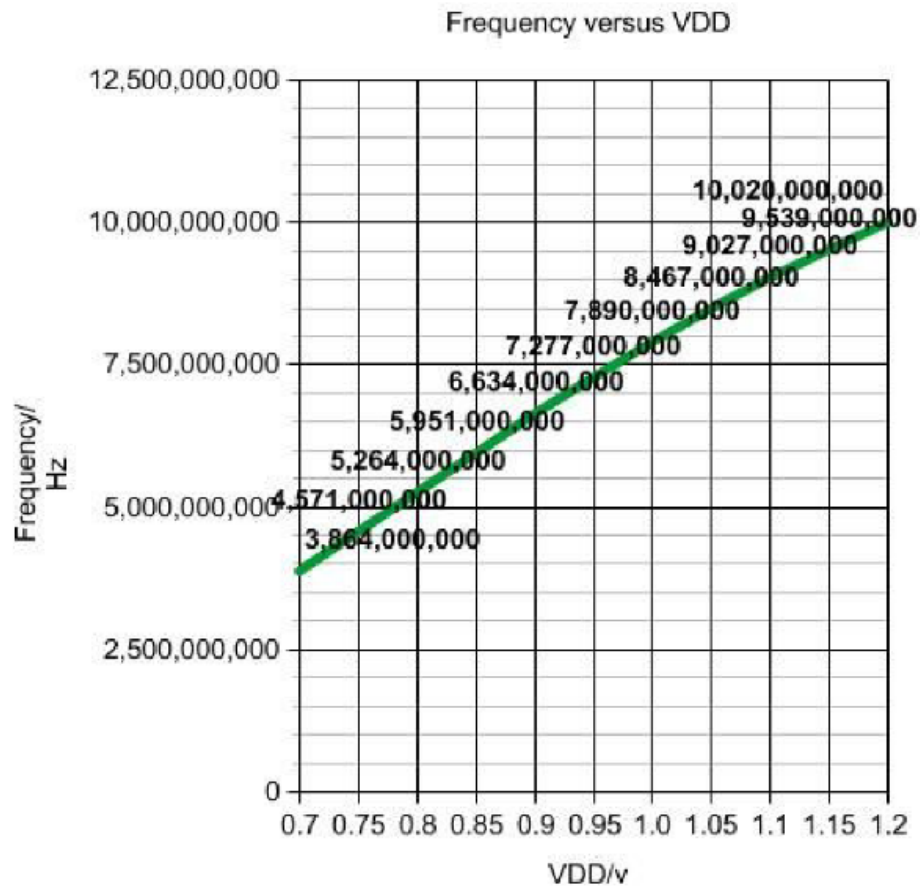
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Part 7: Additional Questions
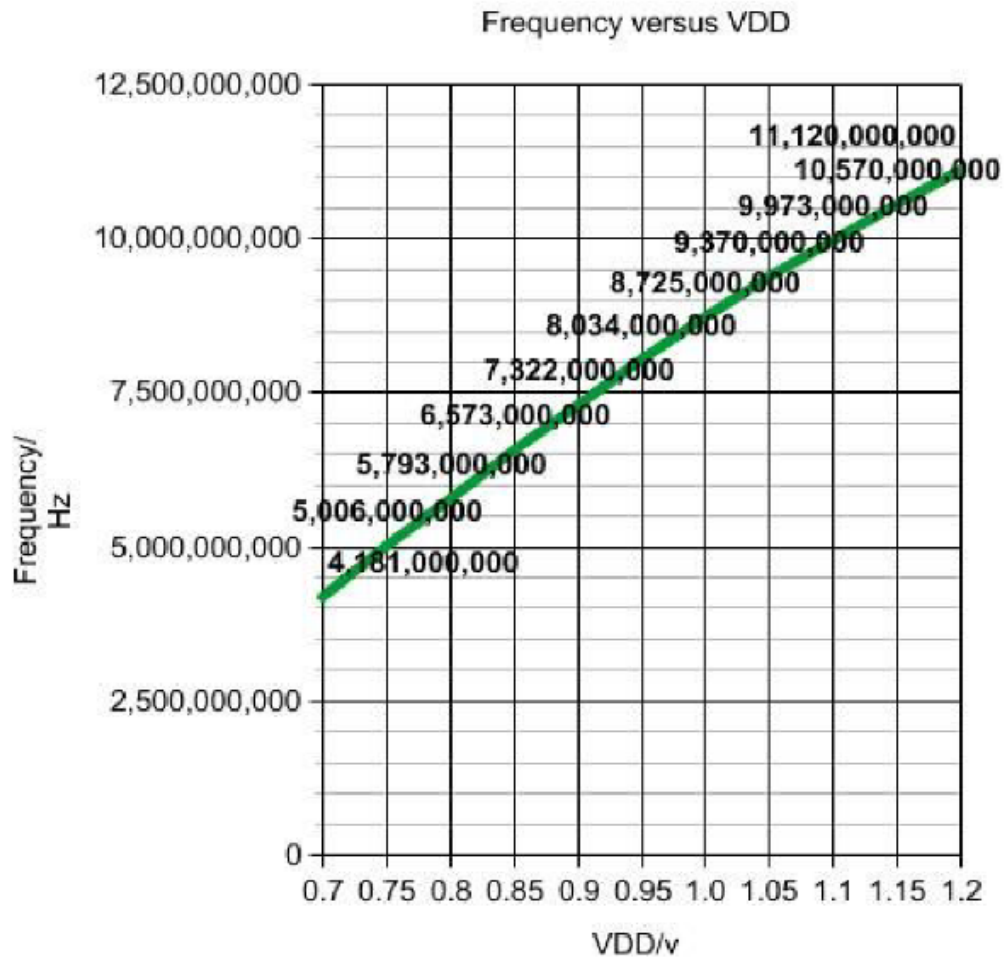
RING_OSC SCHEMATIC

Frequency versus VDD

RING_OSC LAYOUT

Frequency versus VDD

The chart shows Frequency/Hz (y-axis) versus VDD/v (x-axis) with the following data points:

- 2,172,000,000
- 2,613,000,000
- 3,050,000,000
- 3,486,000,000
- 3,905,000,000
- 4,308,000,000
- 4,702,000,000
- 5,072,000,000
- 5,422,000,000
- 5,761,000,000
- 6,081,000,000

X-axis (VDD/v): 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.05, 1.1, 1.15, 1.2

Y-axis (Frequency/Hz): 0, 2,000,000,000, 4,000,000,000, 6,000,000,000, 8,000,000,000
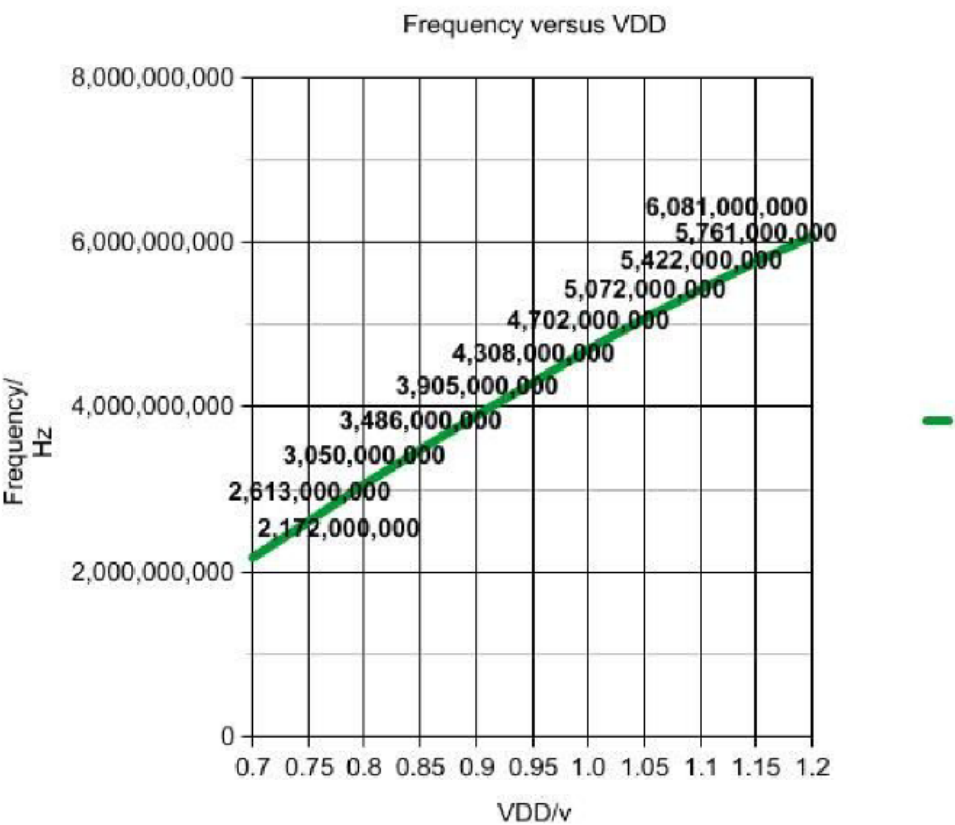
RING_OSC_2X SCHEMATIC

Frequency versus VDD

The reason that ring_osc and ring_osc_2x are similar is that the time constant does not change. When you double the width, the resistance decreases, but capacitance increases, and the proportion is the same, so time constant does not change, and then they will have a similar curve.

The reason that all three graphs are linear is that the vdd is linearly related to rise time and fall time, so the curve will be linearly related to rise time and fall time.