**Experiment-4**

**Aim:**

To implement a common gate amplifier of gain 10 and analyze its transient and ac characteristics.

**Tool Used:**

LTspice

**Theory:**

The common-gate (CG) amplifier for MOSFET is the analogue of the common base amplifier for BJT. Its popularity arises from its lower noise and ease of impedance matching.

For a Level 3 NMOS let’s assume

VGS = 0.6V

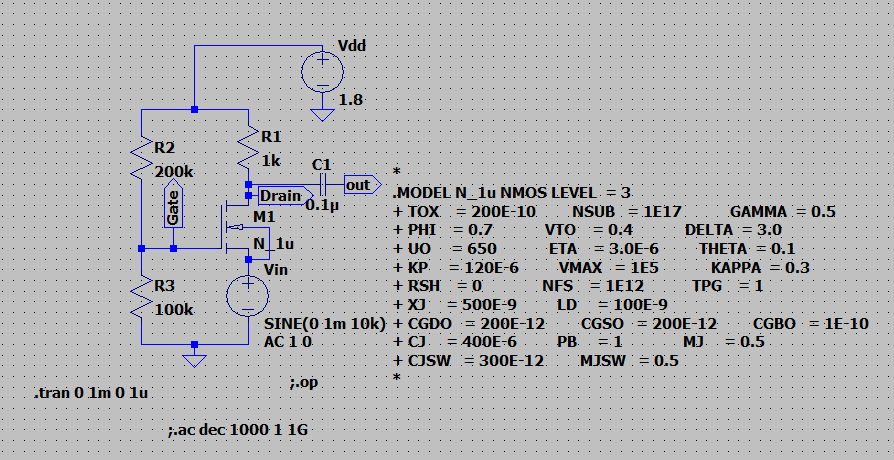
VT = 0.4V

VDD = 1.8V

Kn = 120µA/V2,

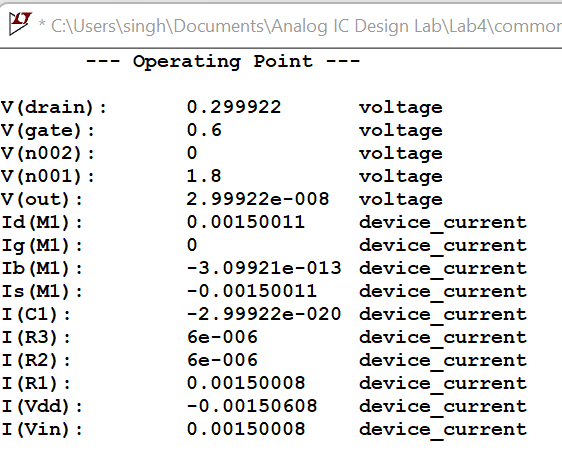
Which gives a value of (W/L) = 416 for 1mA ID. Also, for these values’ gm is attained as 10mΩ-1, therefore for gain 10, RD is taken as 1KΩ. The value of VDS should be maintained above (VGS - VT = 0.6 - 0.4 = 0.2V) for the transistor to stay in saturation region. As W/L is 416, the width is taken as 416µm and the length is taken as 1µm.

**Circuit Schematic:**

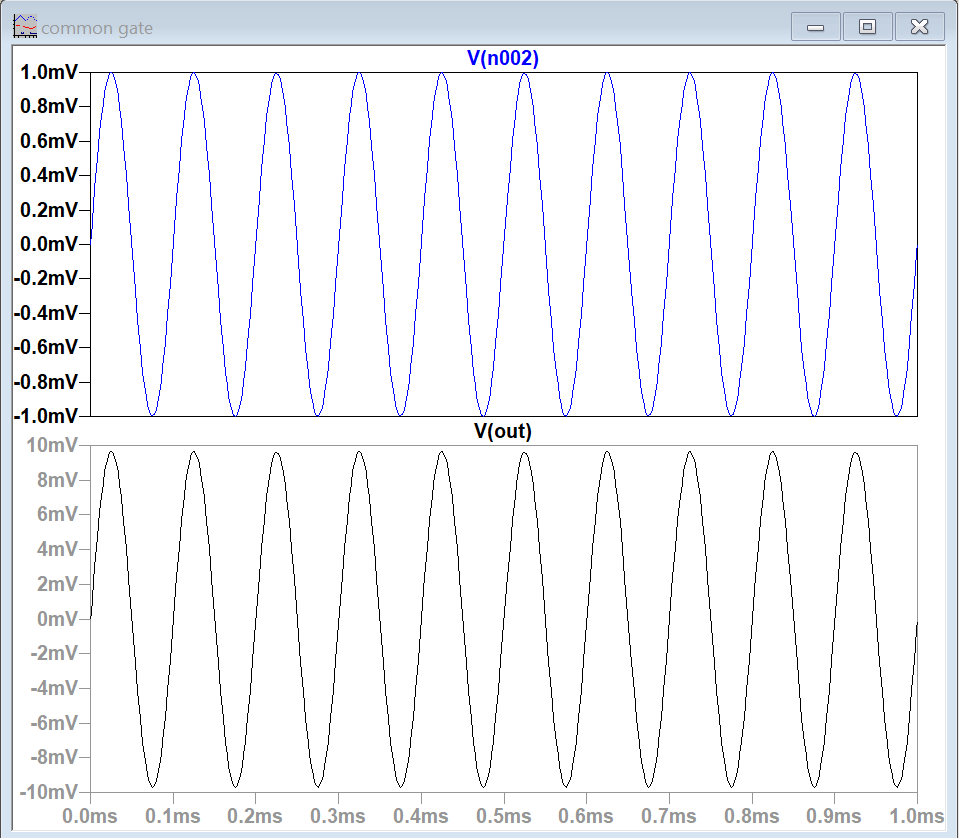
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**Output Waveforms:**

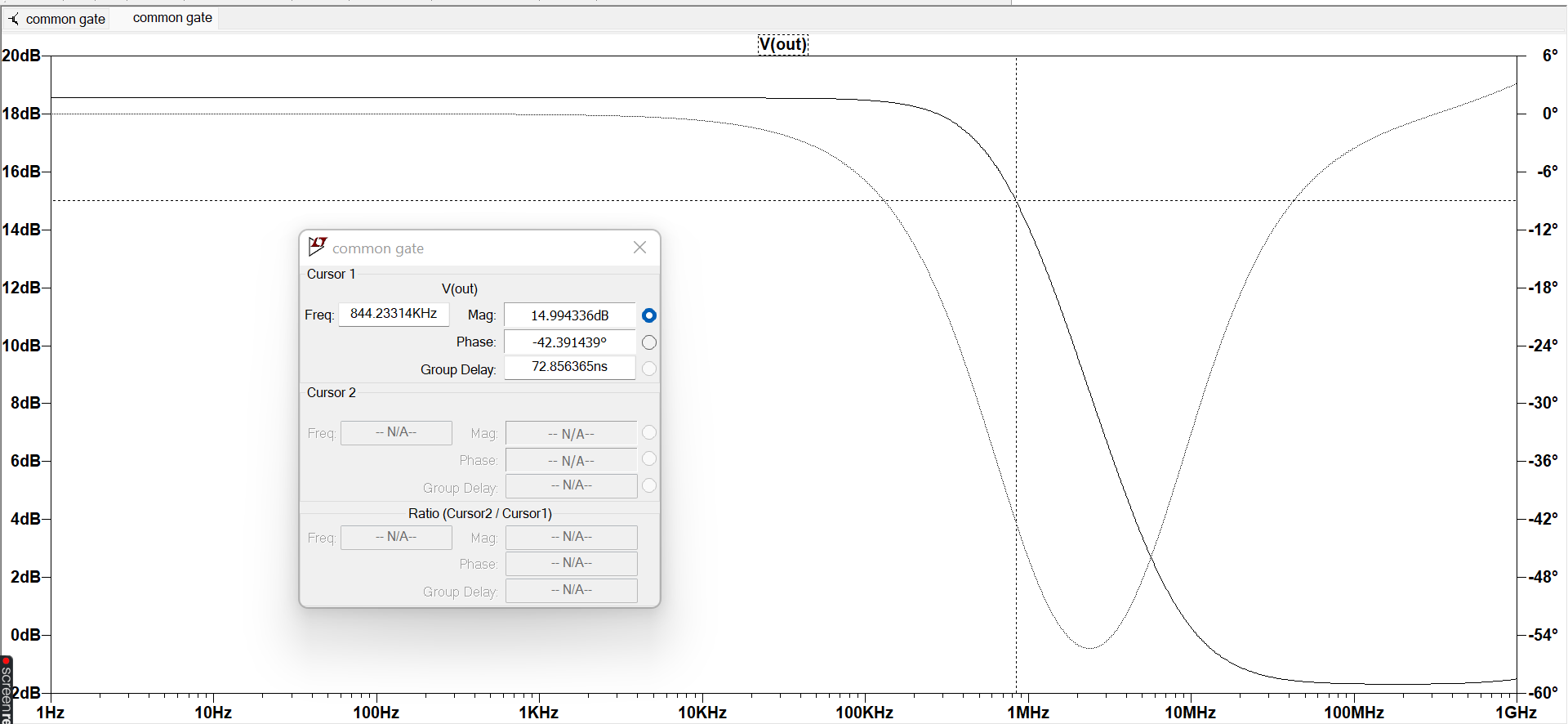
DC operating Point

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Transient characteristics

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AC Analysis

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**Result:**

The circuit is designed for a gain of 10 and the output is verified to be correct. The transient and AC characteristics are visualized.

Bandwidth, FC = 844KHz.