

3.3 MOSFET small signal model Amplifiers

It provides an excellent voltage gain with high input impedance. Due to these characteristics, it is often preferred over BJT.

Three basic FET configurations

Common source, common drain and common gate

MOSFET low frequency a.c Equivalent circuit

Figure shows the small signal low frequency a.c Equivalent circuit for n-channel JFET.

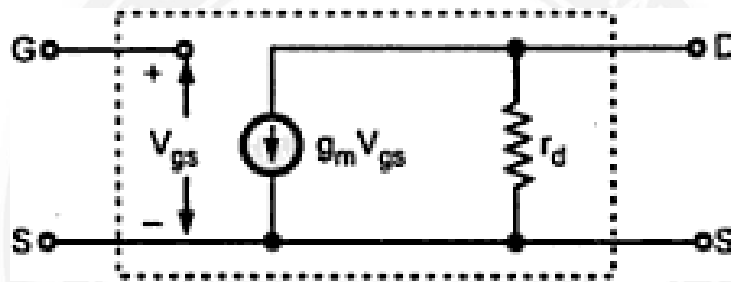


Fig 3.3.1 small signal model of JFET

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 135]

Common Source Amplifier with Fixed Bias

Figure shows Common Source Amplifier with Fixed Bias. The coupling capacitor C1 and C2 which are used to isolate the d.c biasing from the applied ac signal act as short circuits for ac analysis.

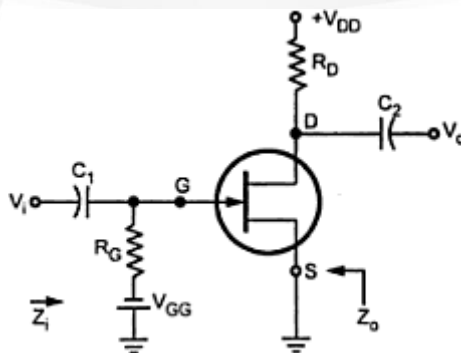


Fig 3.3.2 Common source circuit of JFET

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 135]

The following figure shows the low frequency equivalent model for Common Source Amplifier with Fixed Bias. It is drawn by replacing

- All capacitors and d.c supply voltages with short circuit
- JFET with its low frequency a.c Equivalent circuit

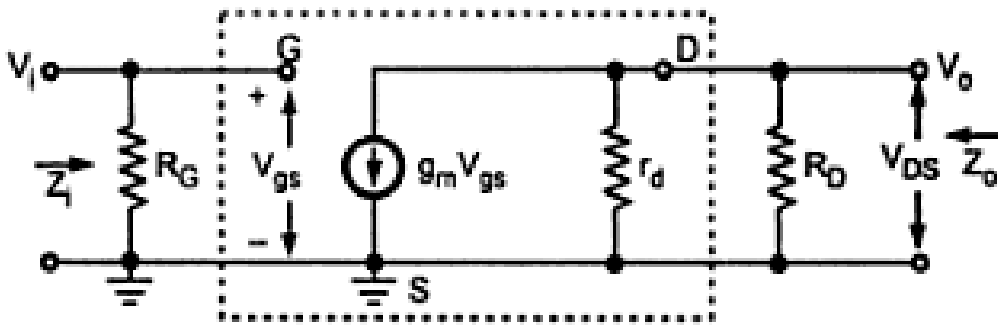


Fig 3.3.3 small signal model of CS MOSFET amplifier

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 135]

- Input Impedance Z_i or $Z_i = R_G$
- Output Impedance Z_o

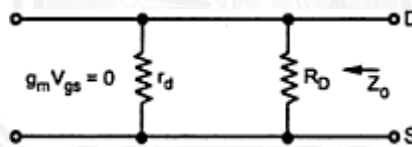


Fig 3.3.4 Equivalent circuit model of MOSFET for output

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 136]

It is the impedance measured looking from the output side with input voltage V_i equal to Zero.

As $V_i=0$, $V_{gs}=0$ and hence $g_m V_{gs}=0$. And it allows current source to be replaced by an open circuit.