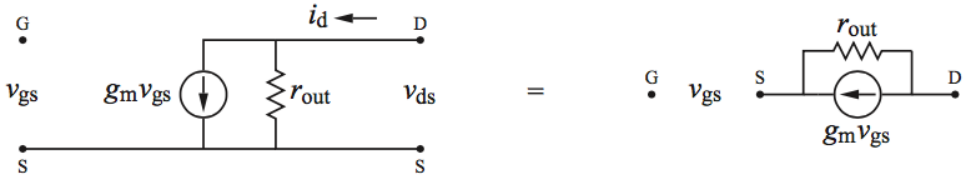
How To Analyze FET Amplifiers with AC Equivalent Circuits

This is very similar to the bipolar transistor how-to.

1. Treat coupling capacitors as shorts (assuming they are large enough).
2. Short the supply to ground.
3. Insert the AC FET model,



   To do this, snip out the transistor and attach the idealized transistor circuit in the diagram, matching up gate, drain and source.

4. Simplify the circuit where possible (look for Thevenin-type equivalents). Often r_{out} can be considered infinite and removed from the approximate diagram.
5. Draw the following quantities on the circuit: v_{in}, v_{out}, i_{in}, i_{out}, v_{gs}.
6. Draw G, D, S at the locations of the gate, drain and source.
7. Compute a, g, Z_{in} and Z_{out} by writing v_{in}, v_{out}, i_{in}, i_{out} in terms of v_{gs}.
   - The gain is $a = \frac{v_{\text{out}}}{v_{\text{in}}}$. The "open loop" gain (open circuit at output) is $a_{OL} = \frac{v_{\text{out}}(R_L=\infty)}{v_{\text{in}}}$.
   - The current gain is $g = i_{\text{out}}/i_{\text{in}}$.
   - The input impedance is $Z_{\text{in}} = v_{\text{in}}/i_{\text{in}}$.
   - The output impedance is $Z_{\text{out}} = \frac{v_{\text{out}}(R_L=\infty)}{i_{\text{out}}(R_L=0)}$.

You will then have a full characterization of the amplifier behavior.