Biasing networks

- Biasing networks are needed to set appropriate operating conditions for active devices

There are two types:

- Passive biasing (or self-biasing)
  - resistive networks
  - drawback: poor temperature stability

- Active biasing
  - additional active components (thermally coupled)
  - drawback: complexity, added power consumption
Passive biasing

- Simple two element biasing
- Blocking capacitors $C_B$ and RFCs to isolate RF path
- Very sensitive to collector current variations
Passive biasing

- Voltage divider to stabilize $V_{BE}$
- Freedom to choose suitable voltage and current settings ($V_x, I_x$)
- Higher component count, more noise susceptibility

$I_B \sim 10 \cdot I_X$
Active biasing

- Base current of RF BJT (Q₂) is provided by low-frequency BJT Q₁
- Excellent temperature stability (shared heat sink)
- high component count, more complex layout
Active biasing in common base

DC path

RF path
FET biasing

Bi-polar power supply

Uni-polar power supply

$V_G < 0$ and $V_D > 0$
Matching to Self-Biased BJT Amp

- Design self-bias circuit as usual
- Design input and output matches to S11 and S22 respectively
Equivalent RF Model of BJT Amp

• The equivalent RF model of the self-biased BJT amp is shown. Note that bias resistors do not affect RF performance.
Matching to Self-Biased JFET Amp

- Design self-bias circuit as usual
- Design input and output matches to S11 and S22 respectively
Equivalent RF Model of JFET Amp

• The equivalent RF model of the self-biased JFET amp is shown. Note that bias resistors do not affect RF performance.
Matching Networks for Amplifiers

- Conjugate matching must be used for maximum power transfer
- Standard impedance matching using either two element L-C, Pi- or Tee-type network, or microstripline matching.
- Use Smith Charts with associated Node Quality Factor $Q_n$ to determine network
Stub Tuner Matching for RF BJT Amp

- Can implement impedance matching network with microstriplines
- Shown is single stub tuner with shorted stub