Obtaining Dominant SPICE Parameters from Curve Tracer Data

Output Characteristic

This is a plot of collector current versus collector to emitter voltage for stepped base current.

Each major vertical step is 1 mA. Each major horizontal step is 2 V.

The bottom curve is the base current is 5 microamps. The next 10, 15,

From the data from the curve tracer

Early Voltage \( V_A := 146.04 \text{V} \) This is the SPICE parameter VAF

Arbitrary pick a point to measure the collector and base currents for a collector to emitter voltage

Pick \( V_{CE} := 5 \text{V} \quad I_B := 5.5 \mu\text{A} \quad I_C := 4.81 \text{mA} = 4.8 \text{mA} \)
\[ \beta_o := \frac{I_C}{I_B} = 185.644 \]

This is the SPICE parameter BF

Transfer Characteristic

"Transfer_NPN"

This is a plot of the collector current versus the base to emitter voltage

Pick a point and get values of collector current and base to emitter voltage

\[ I_C := 5.1 \text{mA} \quad V_{BE} := 0.7 \text{V} \]

\[ V_T := 25.9 \text{mV} \]

\[ I_{SO} := \frac{I_C}{V_{CE}} \exp\left(\frac{-V_{BE}}{V_T}\right) = 8.844 \times 10^{-15} \text{A} \]

\[ I_{SO} \quad \text{is the SPICE parameter IS} \]
Sweep

DC Transfer Characteristic

- vxce Voltage (V)
  - 0
  - 3m
  - 5m
  - 8m
  - 10m
  - 13m

- Voltage (V)
  - 0
  - 3m

- vyce Voltage (V)
  - 0
  - 3m
  - 5m
  - 8m
  - 10m
  - 13m
Circuit for Output Characteristic NPN BJT

Circuit for Transfer Characteristic NPN BJT