

THE MAGICAL V_{BE}

$$I_C = I_S(T) \exp V_{BE}/V_T \quad V_{BE} = V_T \log (I_C / I_S(T))$$

The BJT is:

- a *voltage-controlled current-source*
- $I_S(T)$ is determined by the *base doping*
- Its *transconductance* (g_m) is I_C/V_T and is independent of -
 - The *material* (Si, Ge, SiGe, GaAs...)
 - The *device scaling* (its dimensions)
- The *base current* is purely incidental (it is best viewed simply as a “defect”)

