Lecture 19

→ refer to the printout on Transistor Amp. Config.

**Darlington Pair**

acts like a single trans. with large $\beta$

$$
\begin{align*}
I_c &= I_{c1} + I_{c2} \\
&= I_{b1} \cdot \beta_1 \cdot \beta_2 + I_{b2} \cdot \beta_2
\end{align*}
$$

$$
I_c = I_{b1} \cdot \beta_1 \cdot \beta_2
$$

Note:

- $V_{be} \approx 2 \times 0.6 \text{ V}$
- $Q_2$ cannot be driven into saturation
  - b/c $V_{cb2} = V_{ce1} > 0$ (cannot forward bias base-emitter junction)
- use to make $R_{in}$ large in UBER, CC, CE amps
  - (whenever $R_{in} \propto \beta$)
Power in transistors

Q: power consumption in Q largest?
A: power → 0 in cutoff; also small in satur. Max in active

Class A amplifiers
- transistor is active for largest range of inputs
- draws power when no signal
pros: great fidelity (360° of ac transmitted); speed
cons: poor efficiency (≤50%)

Class B
- transistor is in cutoff with no signal, turns on for only half the cycle (180°)
pros: better efficiency (P~0 when no signal) e.g., OK for audio
cons: some problems with fidelity; need V_{be}~0.6V for Q to go active

Class C
- transmits < 180°; Q can go into saturation worst fidelity, good efficiency (simple loudspeaker)