

ECE 523/421 – Analog Electronics

Lecture 10: Analog IC Building Blocks: Transistor Pairing

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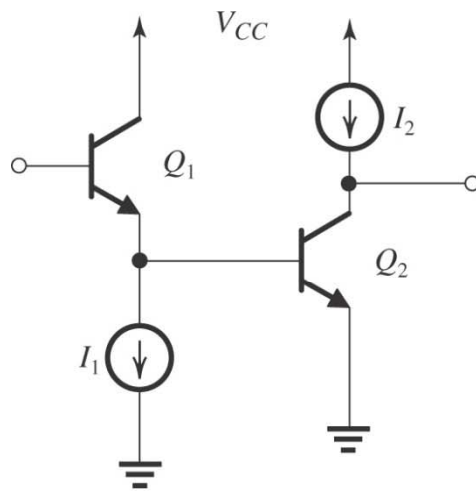
Review of Last Lecture

- ☐ **Cascode Current Mirror Circuits**
- ☐ **BJT Mirrors with Base Compensation Circuit**
- ☐ **Wilson Current Mirror**
- ☐ **Widlar Current Source**

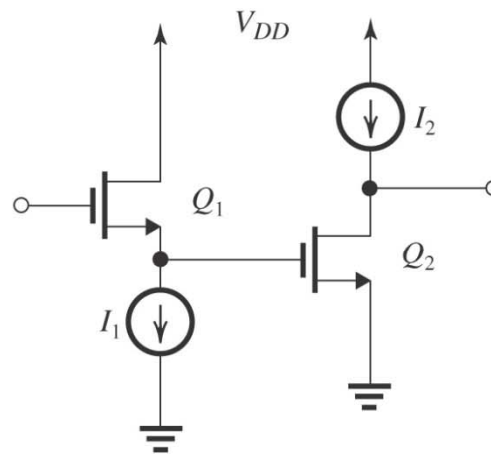
Today's Lecture

- ☐ **CC-CE, CD-CS, and CD-CE Configurations**
- ☐ **Darlington Configuration**
- ☐ **CC-CB and CD-CG Configurations**

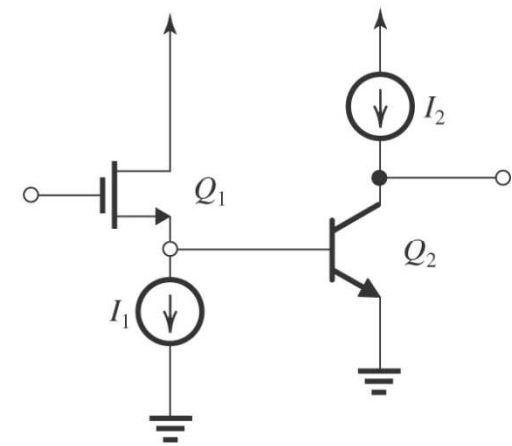
CC-CE, CD-CS, and CD-CE Configurations



(a)



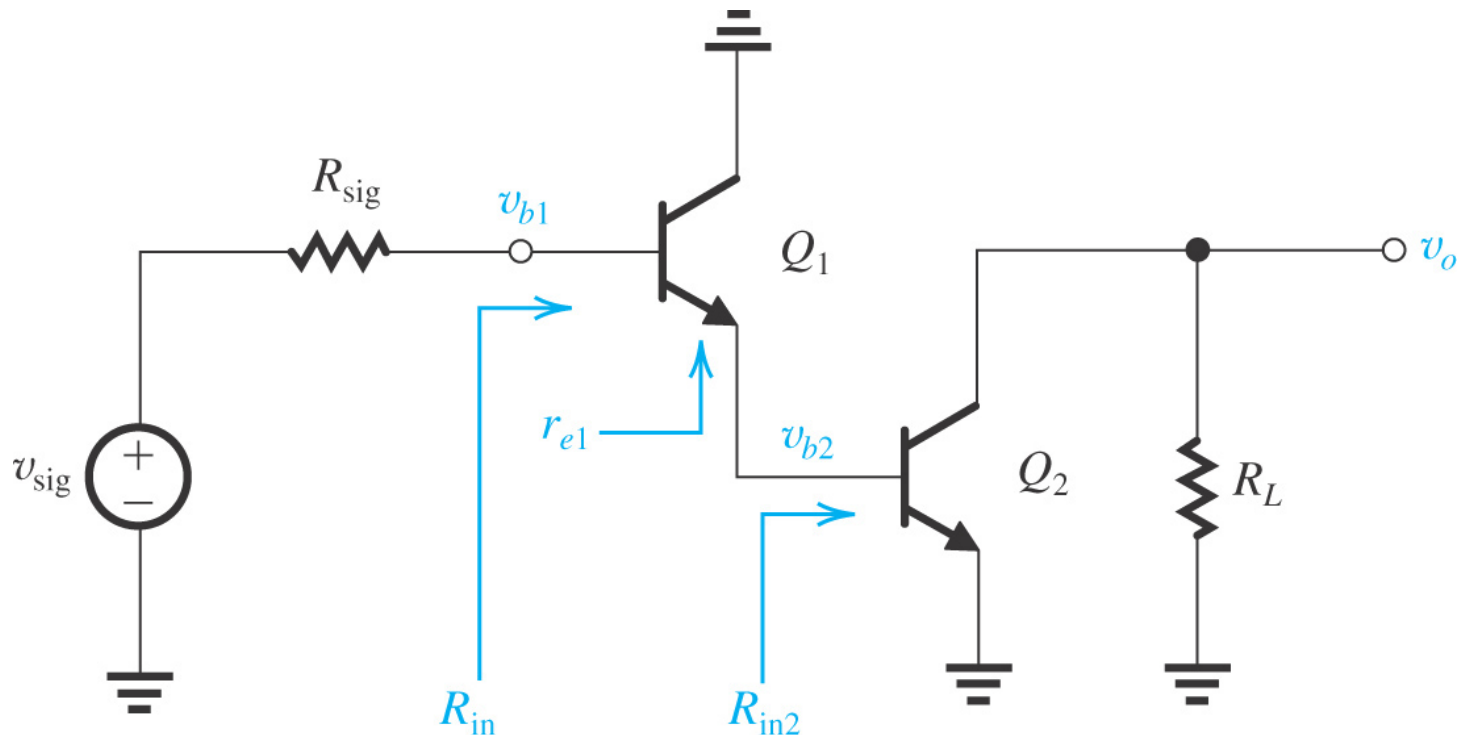
(b)



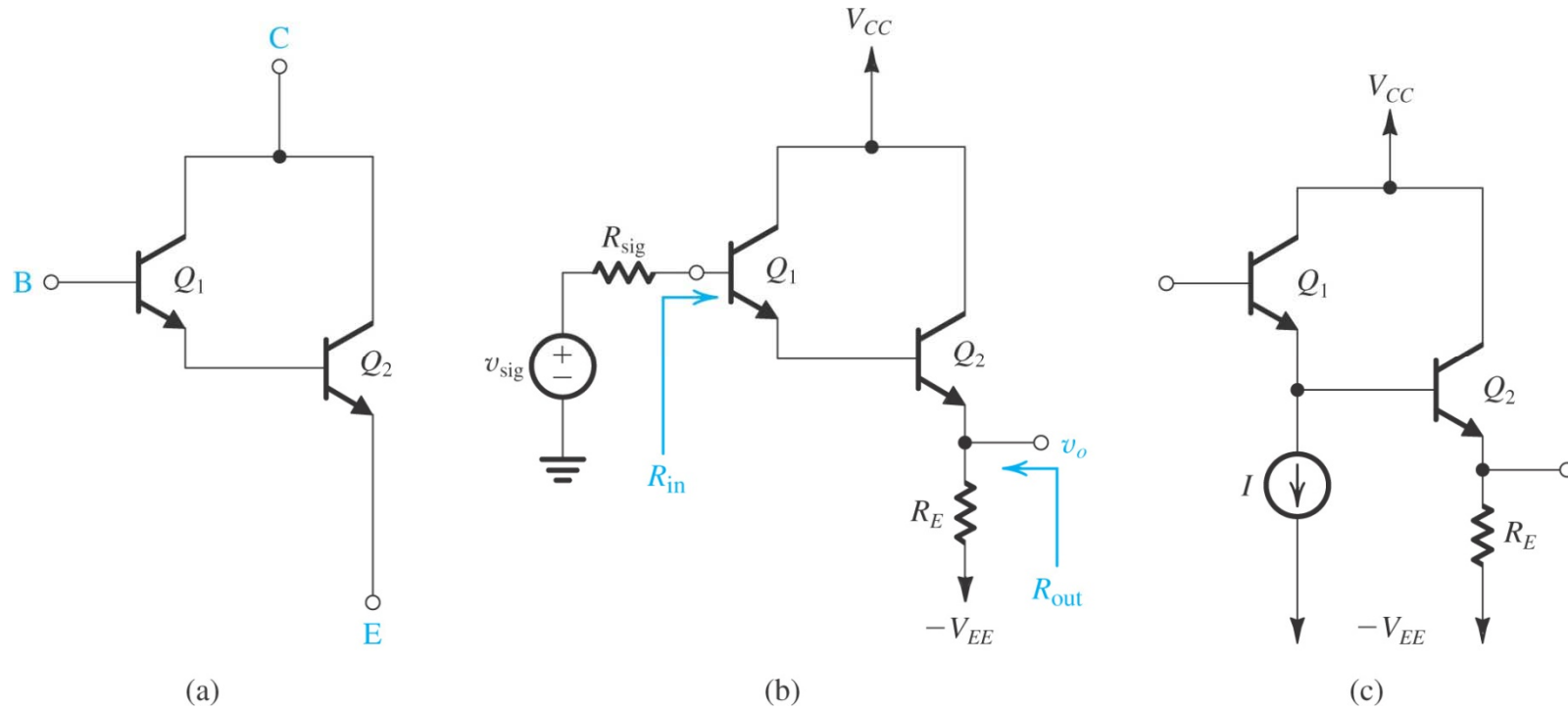
(c)

Example: CC-CE Amplifier Analysis

- 1) Let $I_1=I_2=1\text{mA}$, $\beta=100$, $R_{\text{sig}}=4\text{K}\Omega$ and $R_L=4\text{K}\Omega$. Determine R_{in} and the overall gain and compare with single CE stage amplifier.



Darlington Configuration

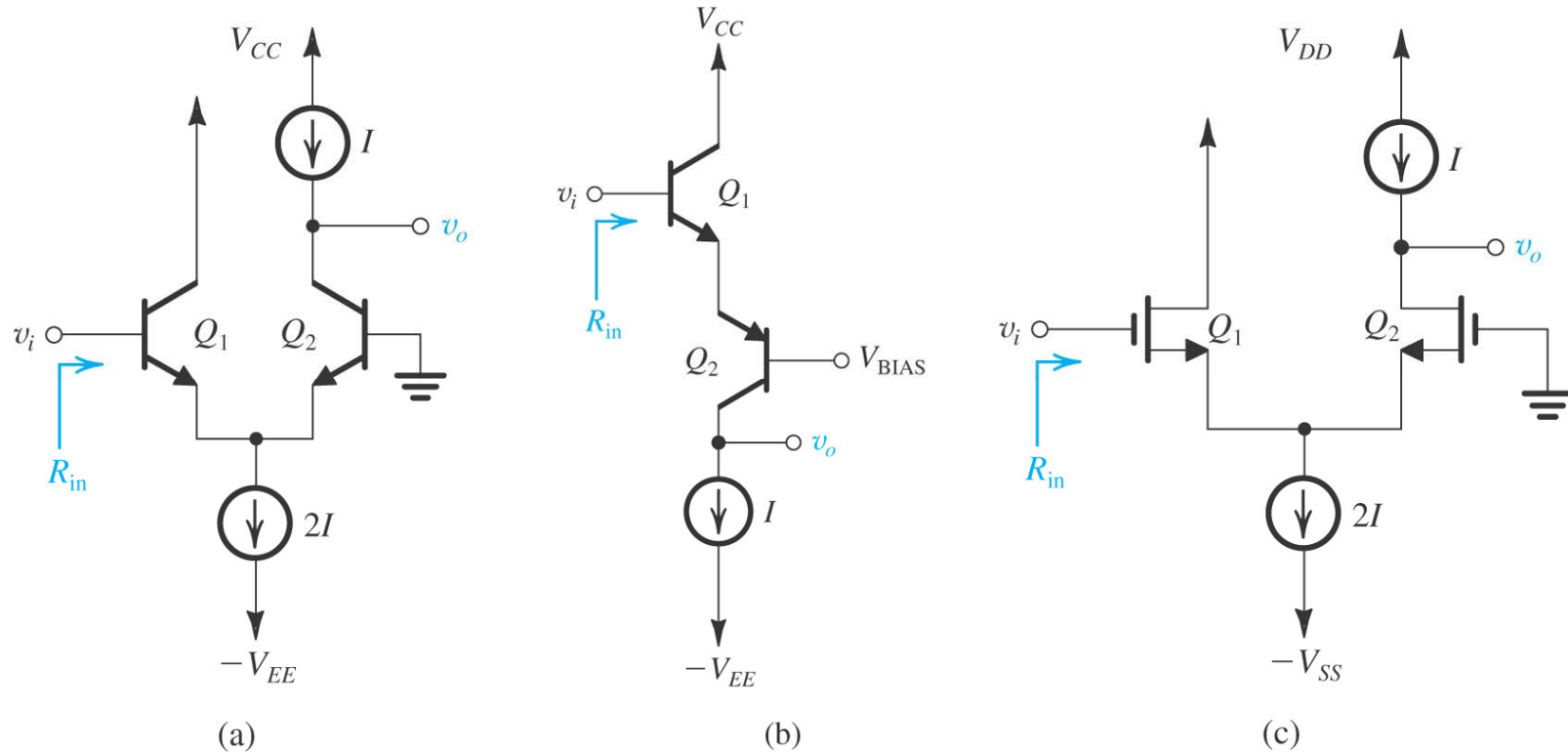


$$R_{in} = (1 + \beta_1)[r_{e1} + (1 + \beta_2)(r_{e2} + R_E)]$$

$$R_{out} = R_E \left\| \left[r_{e2} + \frac{r_{e1} + [R_{sig}/(1 + \beta_1)]}{(1 + \beta_2)} \right] \right.$$

$$\frac{v_o}{v_i} = \frac{R_E}{R_E + r_{e2} + [r_{e1} + R_{sig}/(1 + \beta_1)]/(1 + \beta_2)}$$

CC-CB and CD-CG Configurations



Example: CC-CB Amplifier Analysis

- 1) Find the equations for R_{in} , v_o/v_i , and v_o/v_{sig} in the following transistor pair circuits. Ignore r_o .

