

- A current mirror block can be used as a collector resistor in a common emitter amplifier to give a large effective R_C and high gain.
 - A current mirror block can be used as the shared emitter resistor in a differential amplifier to give a constant current.
 - A common emitter amplifier with a feedback capacitor connected from the collector to the base acts as a low pass filter with a corner frequency proportional to $\frac{1}{C_F}$.
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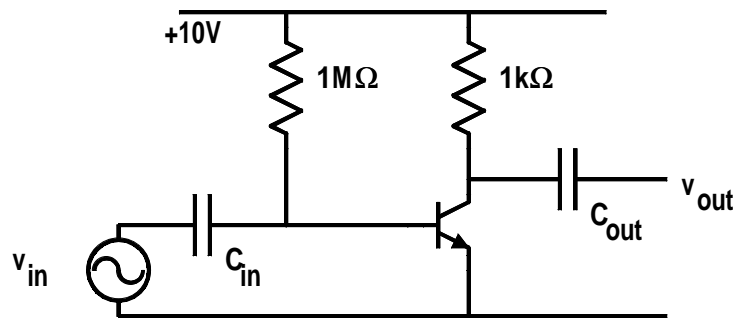
Small number of basic circuit building blocks

Problem solving power results from combining a small number of circuit blocks to make complex systems.

In analysis split a circuit up into smaller blocks

In synthesis small blocks are combined to yield a high performance complex circuit.

Example Operational Amplifier— op-amp.



Gain of Common Emitter amplifier is

$$- R_C \times \frac{I_E}{25mV}$$

Typical CE amplifier gain = -200 .

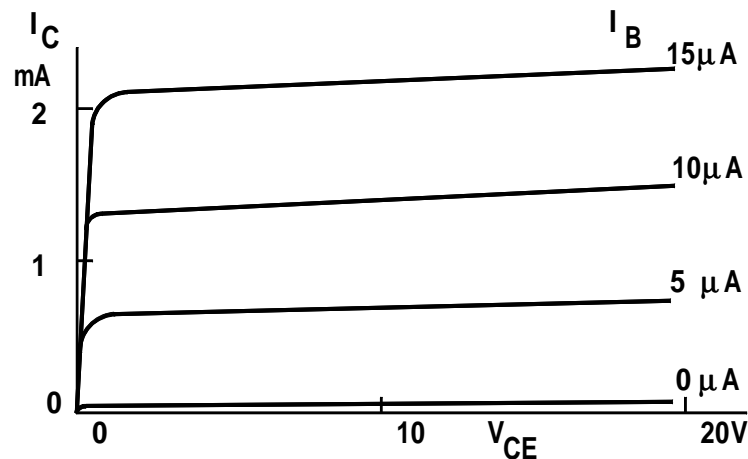
Gain proportional to R_C and I_E

But the supply voltage must also increase to keep $V_{sup} - I_C \times R_C > 0$.

The ideal situation:- Large R_C for small signals

But small R_C for DC currents and voltages

Achieved using an **active load**.



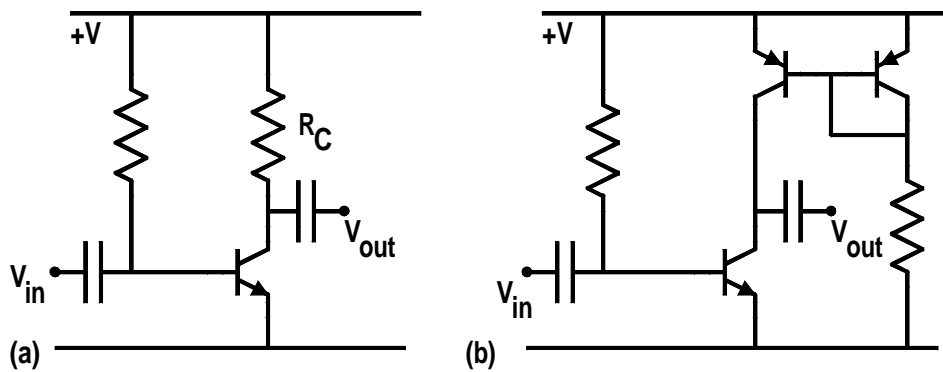
Characteristic curves have a small upward slope or large dynamic resistance

0.2mA for 20V in V_{CE} gives $R_{DYN} = 100k\Omega$

Current mirror shows a small dependence on the V_{CE} .

Use large dynamic resistance of current mirror as a collector load resistor in a common emitter amplifier.

We obtain a large R_C for small signal amplification

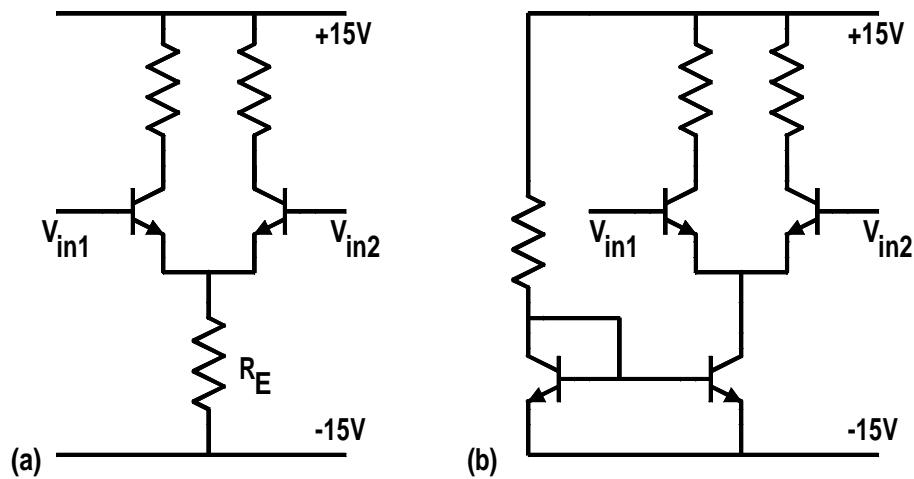


Use a pnp current mirror as instead of the collector resistor.

The collector load resistor in

$$-R_C \times \frac{I_E}{25mV}$$

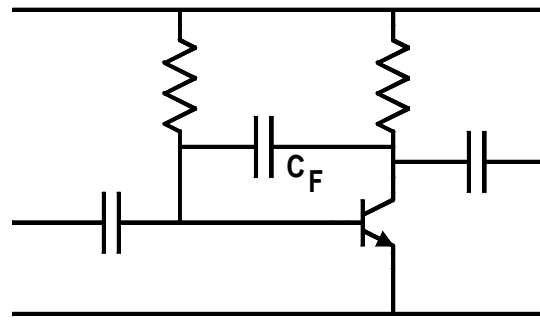
is now given by the collector dynamic resistance, $100k\Omega$, of the current mirror.



Current mirror used as emitter resistor in differential amplifier

The larger the R_E the better is the current balancing

Also the better is the common mode rejection



Use collector–base capacitance to reduce high frequency gain

Amplified and inverted signal is added to the input signal and gives a reduced nett signal at the base and therefore a reduced output signal.

C has a low impedance at high frequency

Expect a decrease of gain at high frequency.

Effect of capacitance is multiplied by factor of $(1+A)$

Called the Miller effect

Bad for HF work but good for stability
