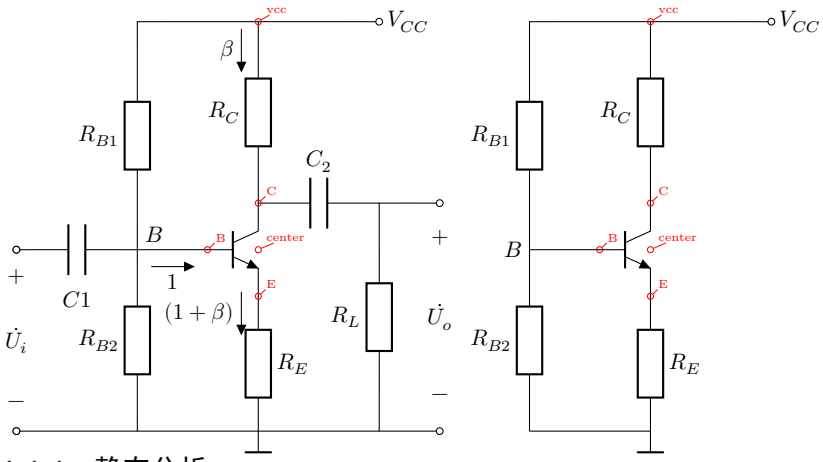
LaTeX

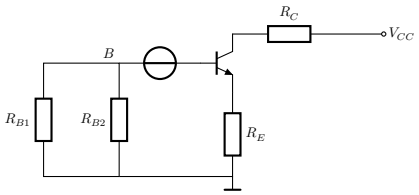
1 三种晶体管放大电路

1.1 分压式偏置电路



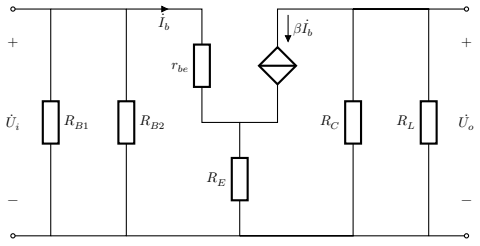
1.1.1 静态分析

$$
\begin{aligned}
U_B &\doteq \frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC} \\
I_B &= \frac{U_B - U_{BE}}{R_{B1} \,//\, R_{B2} + (1+\beta)R_E} \\
&= \frac{U_B - U_{BE}}{(1+\beta)R_E} \\
I_C &= \beta I_B \\
U_{CE} &\doteq V_{CC} - I_C(R_C + R_E)
\end{aligned}
$$

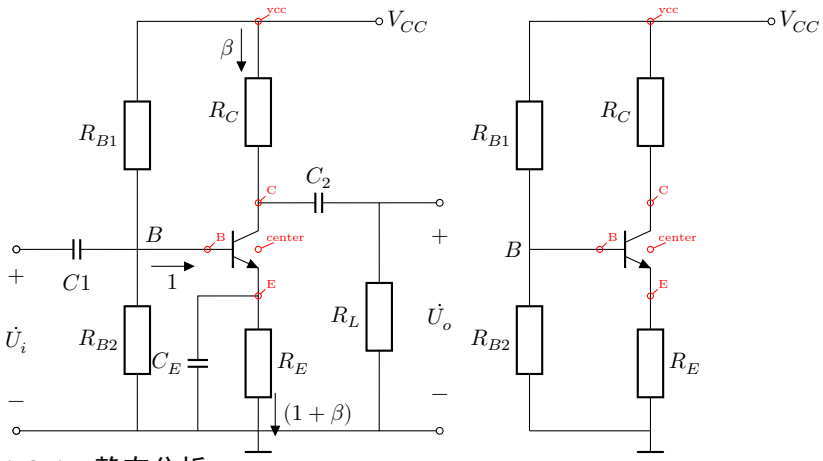


1.1.2 动态分析

$$
\begin{aligned}
r_{be} &= r_{bb'} + (1+\beta)\frac{26\,\mathrm{mV}}{I_E\mathrm{mA}} \\
A_U &= -\frac{\beta(R_C \,//\, R_L)}{r_{be} + (1+\beta)R_E} \\
r_i &= R_{B1} \,//\, R_{B2} \,//\, (r_{be} + (1+\beta)R_E) \\
r_o &= R_C
\end{aligned}
$$

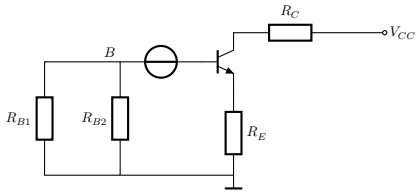


1.2 分压式偏置电路（带旁路电容）



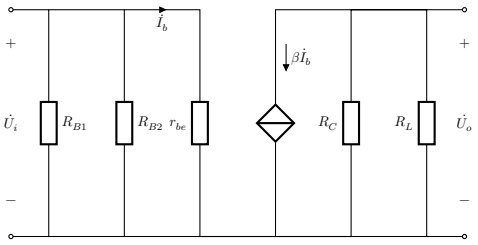
1.2.1 静态分析

$$
\begin{aligned}
U_B &\doteq \frac{R_{B2}}{R_{B1}+R_{B2}}V_{CC} \\
I_B &= \frac{U_B - U_{BE}}{R_{B1} \,//\, R_{B2} + (1+\beta)R_E} \\
&= \frac{U_B - U_{BE}}{(1+\beta)R_E} \\
I_C &= \beta I_B \\
U_{CE} &\doteq V_{CC} - I_C(R_C + R_E)
\end{aligned}
$$

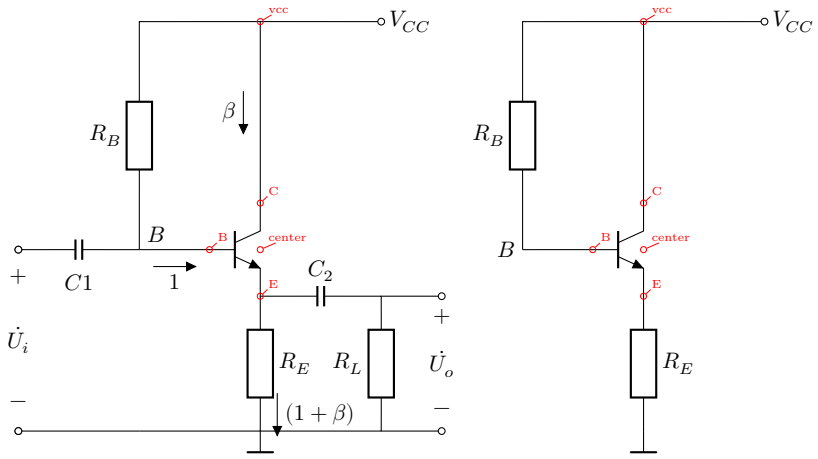


1.2.2 动态分析

$$
\begin{aligned}
r_{be} &= r_{bb'} + (1+\beta)\frac{26\,\mathrm{mV}}{I_E\mathrm{mA}} \\
A_U &= -\frac{\beta(R_C \,//\, R_L)}{r_{be}} \\
r_i &= R_{B1} \,//\, R_{B2} \,//\, r_{be} \\
r_o &= R_C
\end{aligned}
$$



1.3 射极发射器



1.3.1 静态分析

$$I_B = \frac{U_B - U_{BE}}{R_B + (1+\beta)R_E}$$

$$I_C = \beta I_B$$

$$U_{CE} \doteq V_{CC} - I_C R_E$$

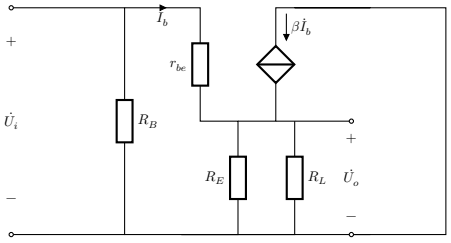
1.3.2 动态分析

$$r_{be} = r_{bb'} + (1+\beta)\frac{26\,\mathrm{mV}}{I_E \mathrm{mA}}$$

$$A_U = \frac{\beta(R_E \,//\, R_L)}{r_{be} + (1+\beta)(R_E \,//\, R_L)}$$

$$r_i = R_B \,//\, [r_{be} + (1+\beta)(R_E \,//\, R_L)]$$

$$r_o = R_E \,//\, \frac{(R_B \,//\, R_S) + r_{be}}{1+\beta} \doteq \frac{r_{be}}{1+\beta}$$



2 模拟集成电路及其应用电路

2.1 集成运算放大电路的线性应用

2.1.1 比例运算电路