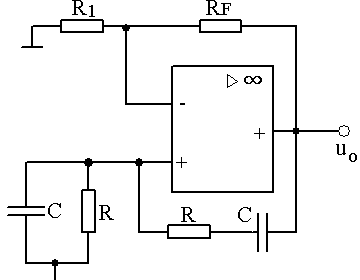


史上最全的运放典型应用电路及分析

电路名称	典型电路	分析方法	主要特征
同相比例器		$u_+ = u_i$ $u_- = \frac{R_1}{R_1 + R_F} u_o$ $\therefore u_i = \frac{R_1}{R_1 + R_F} u_o$	$u_o = \left(1 + \frac{R_F}{R_1}\right) u_i$ <p>(电压串联负反馈)</p>
反相比例器		$u_+ = 0$ $u_- = 0$ $\frac{u_i}{R_1} = -\frac{u_o}{R_F}$	$u_o = -\frac{R_F}{R_1} u_i$ <p>(电压并联负反馈)</p>
反相加法运算		$u_+ = 0$ $u_- = 0$ $\frac{u_i}{R_1} + \frac{u_{i2}}{R_2} + \frac{u_{i3}}{R_3} = -\frac{u_o}{R_F}$	$u_o = -R_F \left(\frac{u_{i1}}{R_1} + \frac{u_{i2}}{R_2} + \frac{u_{i3}}{R_3} \right)$
减法运算电路		$u_+ = \frac{R_3}{R_2 + R_3} u_{i2}$ $u_- = \frac{1}{R_1 + R_2} (R_1 u_o + R_F u_{i1})$ $u_+ = u_-$	$u_o = \left(1 + \frac{R_F}{R_1}\right) \frac{R_3}{R_2 + R_3} u_{i2} - \frac{R_F}{R_1} u_{i1}$ <p>若 $R_1 = R_2 = R_3 = R_F$</p> $u_o = u_{i2} - u_{i1}$
积分运算电路		$u_+ = u_- = 0$ $\frac{u_i}{R} = -C \frac{du_o}{dt}$	$u_o = -\frac{1}{RC} \int u_i dt$
微分运算电路		$u_+ = u_- = 0$ $C \frac{du_i}{dt} = -\frac{u_o}{R}$	$u_o = -RC \frac{du_i}{dt}$

一阶低通滤波电路		$\dot{U}_- = \frac{R_1}{R_1 + R_F} \dot{U}_o$ $\dot{U}_+ = \frac{\dot{U}_i}{R + \frac{1}{j\omega C}}$ $\dot{U}_+ = \dot{U}_-$	$\dot{U}_o = \frac{1 + \frac{R_F}{R_1}}{1 + j\frac{\omega}{\omega_o}} \dot{U}_i$ $\omega_o = \frac{1}{RC}$
一阶高通滤波电路		$\dot{U}_- = \frac{R_1}{R_1 + R_F} \dot{U}_o$ $\dot{U}_+ = \frac{R \dot{U}_i}{R + \frac{1}{j\omega C}}$ $\dot{U}_+ = \dot{U}_-$	$\dot{U}_o = \frac{1 + \frac{R_F}{R_1}}{1 - j\frac{\omega_o}{\omega}} \dot{U}_i$ $\omega_o = \frac{1}{RC}$
同相比较器		$u_i > u_R \quad u_o = +U_{o(sat)}$ $u_i = u_R \quad \text{转折点}$ $u_i < u_R \quad u_o = -U_{o(sat)}$	
反相比较器		$u_i > u_R \quad u_o = -U_{o(sat)}$ $u_i = u_R \quad \text{转折点}$ $u_i < u_R \quad u_o = +U_{o(sat)}$	
滞回比较器		$u_- = u_i$ $u_+ = \frac{R_1}{R_1 + R_2} u_o$	
矩形波发生器		$u_+ = \frac{R_1}{R_1 + R_2} u_o$ $u_- = u_c$	$T = 2RC \ln\left(1 + \frac{2R_2}{R_1}\right)$

<p>RC 正弦 波 发 生 器</p>		<p>放大电路: 选频网络:</p> $A = 1 + \frac{R_F}{R_1}$ $F = \frac{1}{3} \quad \omega_0 = \frac{1}{RC}$	$f_o = \frac{1}{2\pi RC}$
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