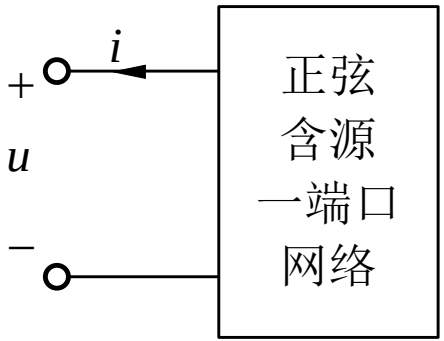
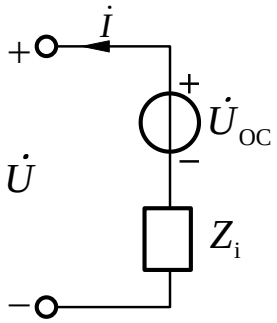
正弦含源一端口网络等效

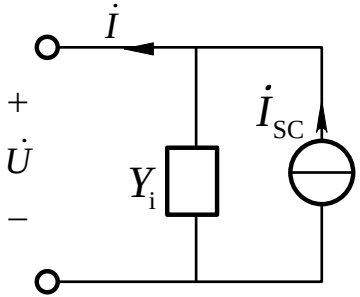
正弦交流含独立源一端口网络如图 (a)所示



(a)



(b)



(c)

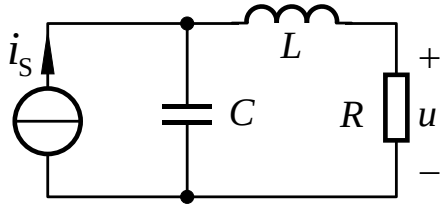
$$\dot{U} = \dot{U}_{OC} - Z_i \dot{I} \qquad \dot{I} = \dot{I}_{SC} - Y_i \dot{U}$$

$\dot{U}_{OC}$ 开路电压相量　　$\dot{I}_{SC}$ 短路电流相量

所有独立源全部置零时，Z_i 端口输入阻抗；Y_i 端口输入导纳

正弦含源一端口网络等效

例 1 图所示电路中 $C=0.01\text{F}, L=0.01\text{H}, i_\text{S}=10\sqrt{2}\cos(\omega t)\text{A}$ 。求 ω 为何值时电压 u 与电阻 R（$R\neq 0$）无关？求出电压 u 。

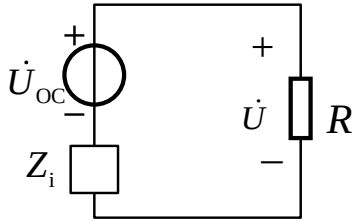


解：

$$\dot{U}_\text{OC}=\dot{I}_\text{S}/(\text{j}\omega C)$$

$$Z_\text{i}=\text{j}\omega L+1/(\text{j}\omega C)$$

当 $Z_\text{i}=0$ 时 $\omega=1/\sqrt{LC}=100\,\text{rad/s}$



$$\dot{U}=\dot{U}_\text{OC}=10\angle 0^\circ\times\frac{1}{\text{j}100\times 0.01}=10\angle -90^\circ\text{V}$$

$$u=10\sqrt{2}\cos(\omega t-90^\circ)\text{V}$$