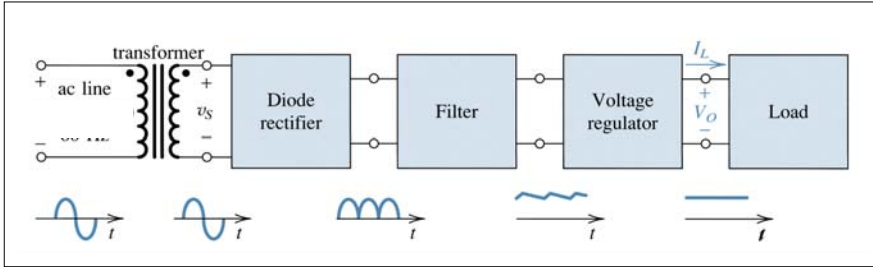
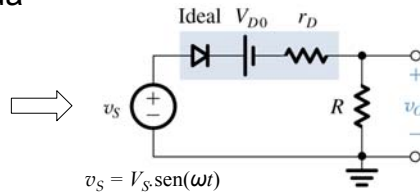
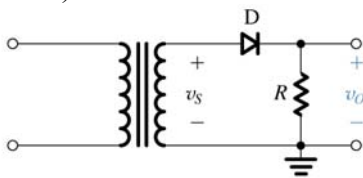


1.5 – Aplicações de Diodos

I) Retificadores

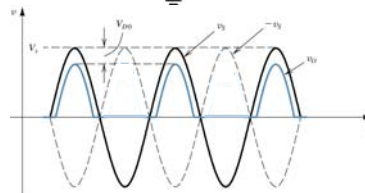
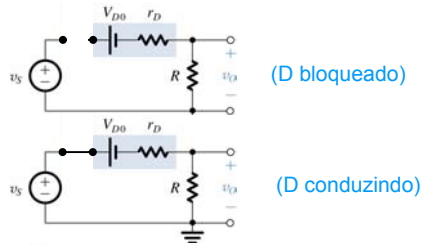
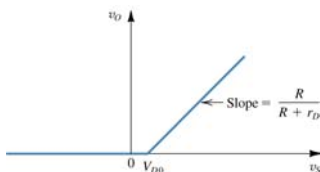


I.a) Retificador de Meia-onda



Característica de Transferência

Para $\begin{cases} v_S < V_{D0} \Rightarrow v_O = 0 \\ v_S > V_{D0} \Rightarrow v_O = (v_S - V_{D0}) \frac{R}{R + r_D} \end{cases}$

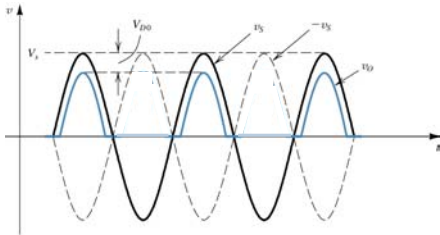


Considerações quanto à representação do diodo:

Se: $r_D \ll R \Rightarrow v_O \approx v_S - V_{Do}$ (Modelo de Queda de Tensão Constante)

e se: $V_S \gg V_{Do} \Rightarrow v_O \approx v_S$ (Modelo de Diodo Ideal)

E se $V_S = 100\text{mV} ??$



Dimensionamento dos Diodos

- Tensão de Pico Reversa (V_{PR})

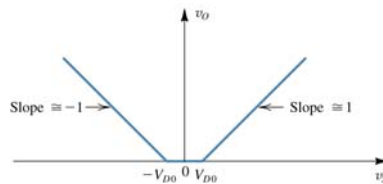
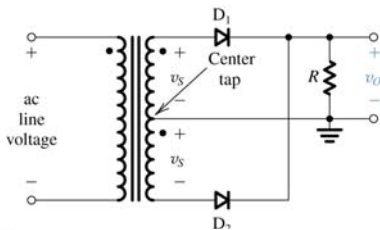
$$V_{PR} = V_O \approx V_S$$

- Corrente Máxima (I_{Dmax})

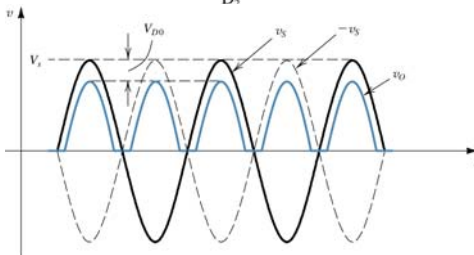
$$I_{Dmax} = \frac{V_S - V_{Do}}{R + r_D} \approx \frac{V_S}{R}$$

I.b) Retificadores de Onda Completa

- com Tap-Central



Característica de Transferência



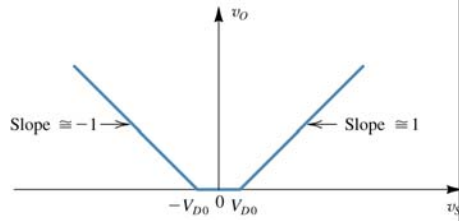
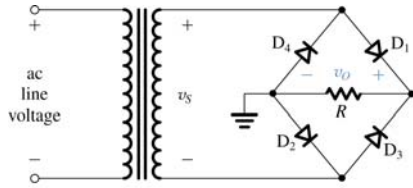
Resposta no tempo

(considerando sinal senoidal)

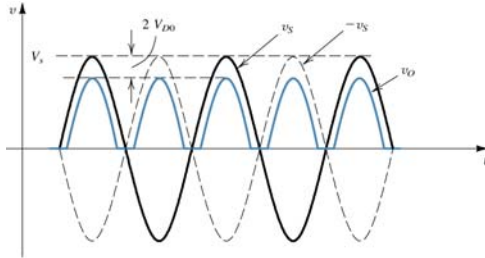
$$V_{PR} = V_S + V_O \approx 2.V_S$$

$$I_{Dmax} = \frac{V_S - V_{Do}}{R + r_D} \approx \frac{V_S}{R}$$

● em Ponte



Característica de Transferência

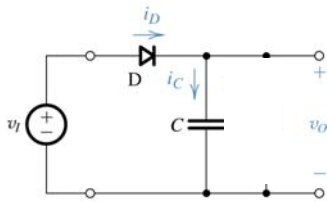


Resposta no tempo
(considerando sinal senoidal)

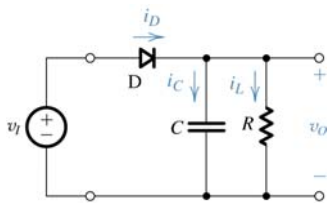
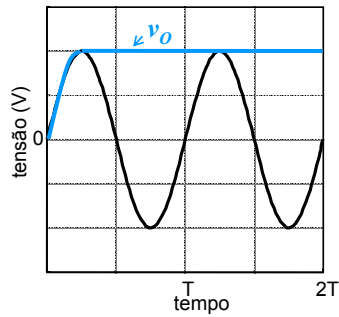
$$V_{PR} = V_O + V_{D0} = V_S - V_{D0} \approx V_S$$

$$I_{Dmax} \approx \frac{V_S}{R}$$

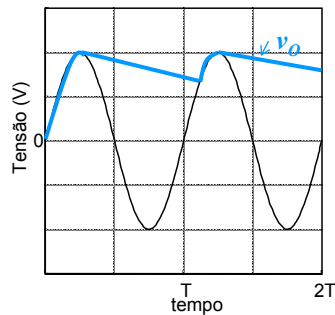
Capacitor de Filtro:

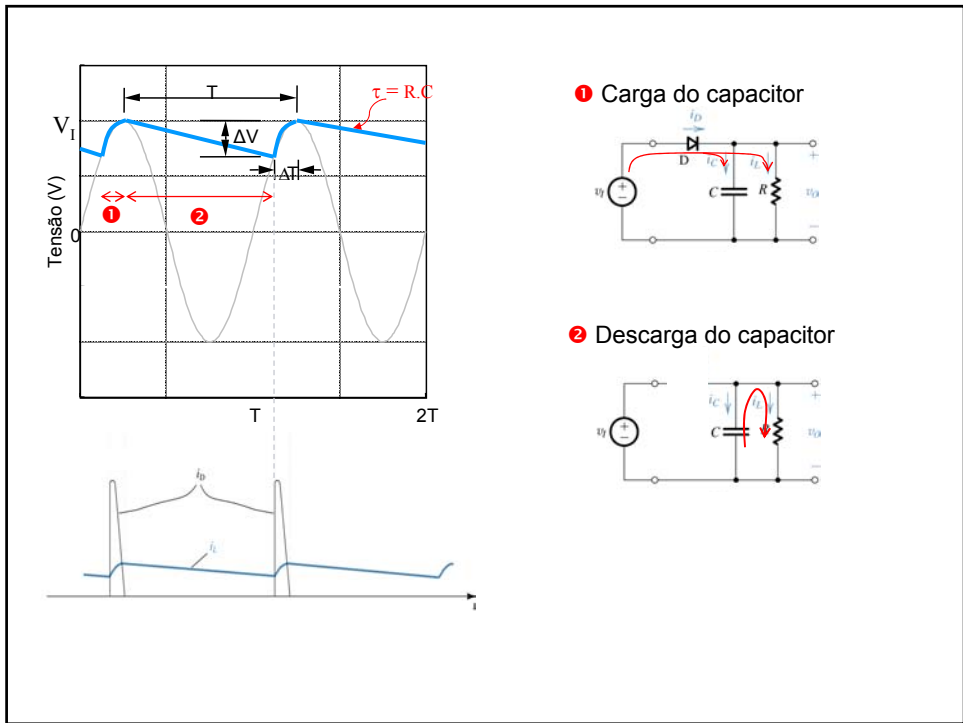


(sem carga)



(com carga)





Determinação do ripple (ΔV)

$$\Delta V = V_1 - V_1 \cdot e^{-T/RC}$$

Como $RC \gg T \Rightarrow e^{-T/RC} \approx 1 - \frac{T}{RC}$

assim:
$$\Delta V = \frac{V_1 T}{RC} = \frac{V_1}{f \cdot RC}$$

Para onda completa:

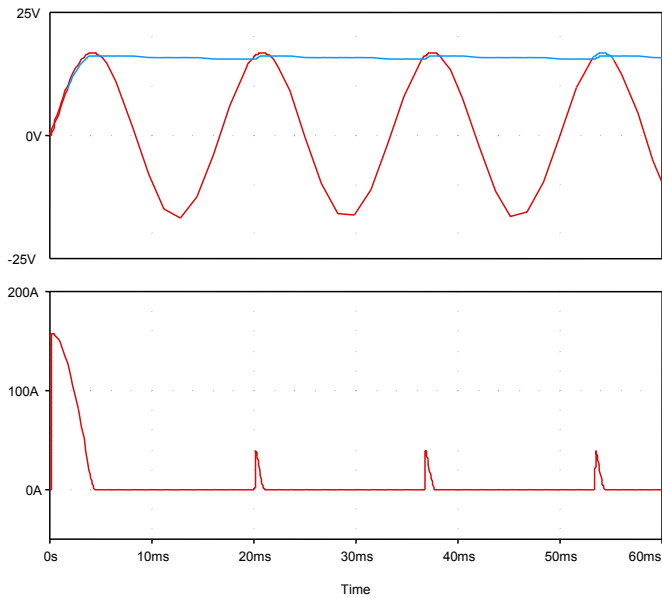
$$f_{\text{onda completa}} = 2 \cdot f_{\text{meia-onda}}$$

Logo, para mesmo ripple (ΔV)

$$C_{\text{onda completa}} = \frac{1}{2} C_{\text{meia-onda}}$$

Exemplo:

Determine o valor do capacitor de filtro de um retificador em ponte de diodos para que o ripple máximo sobre uma carga de 100Ω seja de 1V. Considere que o sinal de entrada seja uma senoide de $60\text{Hz} / 12\text{V}_{\text{RMS}}$



Retificador de meia-onda - Simulação no PSPICE

Dimensionamento dos Diodos

Sem capacitor de filtro:

	Meia-onda	Tap Central	Ponte
V_{PR}	V_I	$2.V_I$	V_I
I_{Dmax}	V_I/R_P	V_I/R_P	V_I/R_P

Com capacitor de filtro:

	Meia-onda	Tap Central	Ponte
Capacitor de Filtro	$C = \frac{V_I}{\Delta V \cdot f \cdot R}$	$C = \frac{V_I}{\Delta V \cdot 2f \cdot R}$	$C = \frac{V_I}{\Delta V \cdot 2f \cdot R}$
V_{PR}	$2.V_I$	$2.V_I$	V_I
I_{Dmax}	I_P	$I_P/2$	$I_P/2$