CONVERTIDOR SEPIC MODIFICADO

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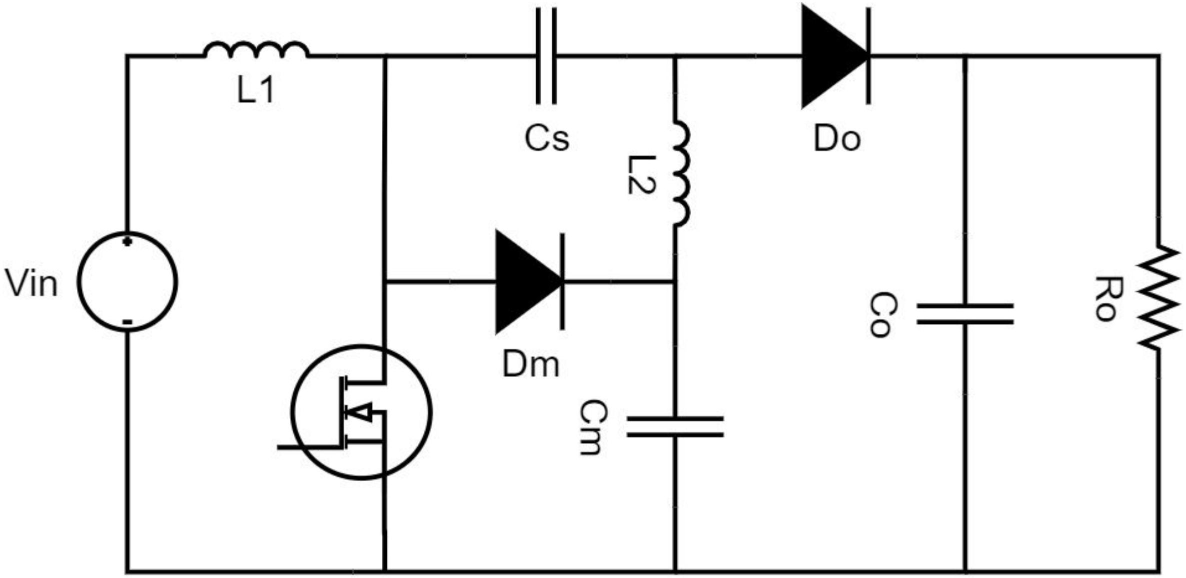
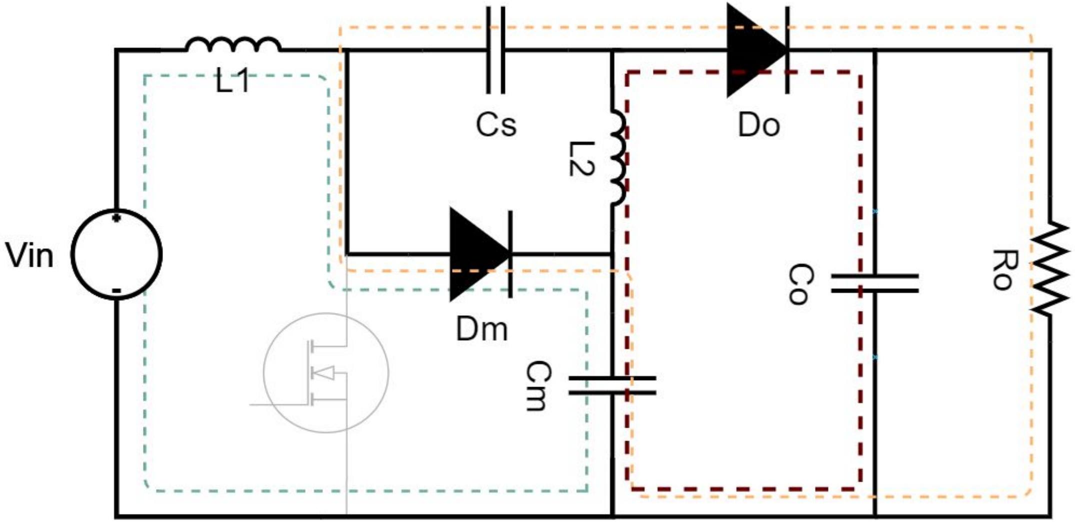
#LaUISqueQueremos



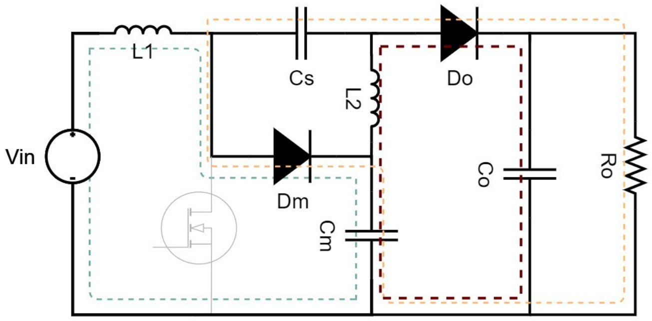
Modified SEPIC converter without magnetic coupling

Modo de operación: S off



Modified SEPIC converter without magnetic coupling

S off



Modified SEPIC converter

$$-Vin - V_{L1,toff} + V_{CM} = 0$$

$$V_{L1,toff} = V_{CM} - V_{in}$$

$$L_{1,off}\frac{\Delta I_{L1}}{toff} = V_{CM} - V_{in}$$

$$\boldsymbol{\Delta I_{L1} = (V_{CM} - V_{in})\frac{toff}{L_{1,off}}} \qquad \textbf{(1)}$$

$$-V_{CM} + V_o - V_{L2,toff} = 0$$

$$V_{L2,toff} = V_o - V_{CM}$$

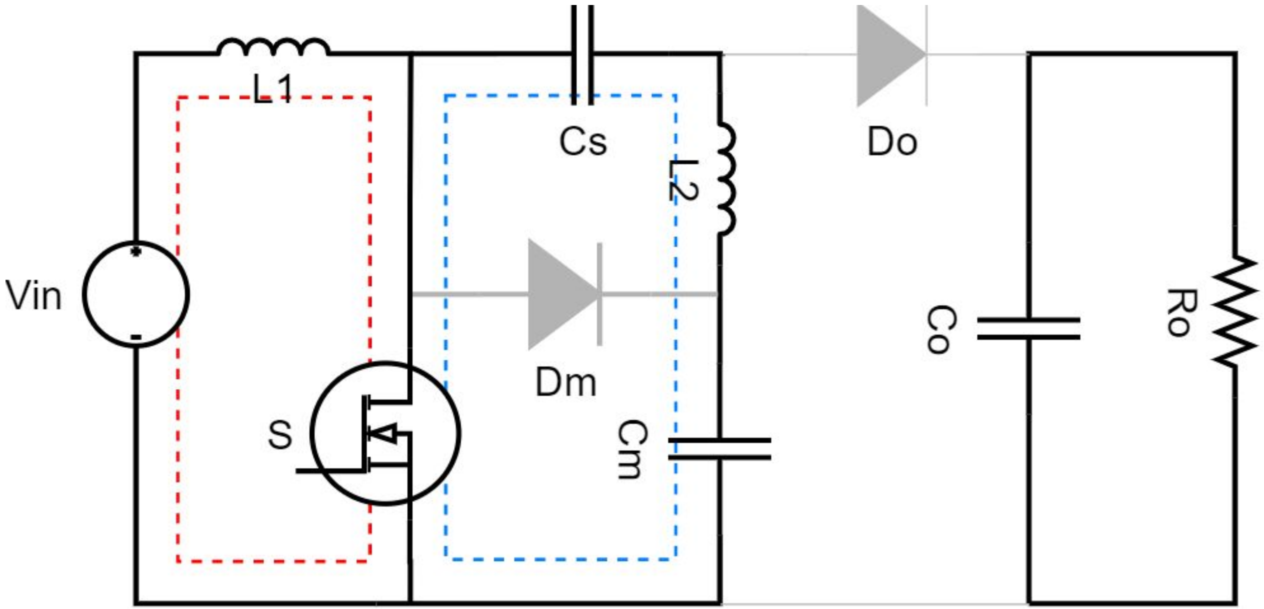
$$L_{2,off}\frac{\Delta I_{L2}}{toff} = V_o - V_{CM}$$

$$\Delta I_{L2} = (\boldsymbol{V_{CM} - V_{in}})\frac{\boldsymbol{toff}}{\boldsymbol{L_{2,off}}} \qquad \textbf{(2)}$$

$$-V_{CM} + V_o - V_{CS} = 0$$

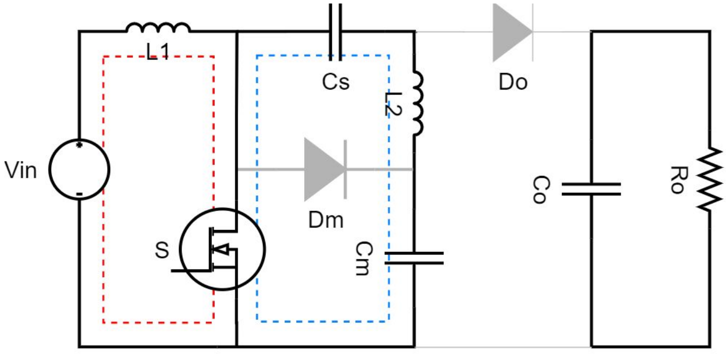
$$\boldsymbol{V_{CS} = V_o - V_{CM}} \qquad \textbf{(3)}$$

Modo de operación: S on



Modified SEPIC converter without magnetic coupling

S on



Modified SEPIC converter

$$V_{L1,ton} = V_{in}$$

$$L_{1,ton}\frac{\Delta I_{L1}}{ton} = V_{in}$$

$$\boldsymbol{\Delta I_{L1} = V_{in}\frac{ton}{L_{1,ton}}} \qquad \textbf{(4)}$$

$$-V_{CS} - V_{L2,ton} + V_{CM} = 0$$

$$V_{L2,ton} = V_{CM} - V_{CS}$$

$$L_{2,on}\frac{\Delta I_{L2}}{ton} = V_{CM} - V_{CS}$$

$$\boldsymbol{\Delta I_{L2} = (V_{CM} - V_{CS})\frac{ton}{L_{2,on}}} \qquad \textbf{(5)}$$

Igualando (1) y (4), se obtiene:

$$V_{in}(toff + ton) = V_{CM}toff$$

$$\frac{V_{CM}}{V_{in}} = \frac{T}{(1-D)T} = \frac{1}{(1-D)} \quad \textbf{(6)} \qquad \text{Con } toff = (1-D)T$$

Igualando (5) y (2), entonces:

$$V_{CM}(toff + ton) = V_{CS}ton + V_o toff$$

$$V_{CM} = \frac{V_{CS}ton + V_o toff}{toff + ton}$$

$$\boldsymbol{V_{CM} = V_{CS}D + V_o(1-D)} \quad \textbf{(7)}$$

Reemplazando (3) en (7):

$$V_{CM} = (V_o - V_{CM})D + V_o(1-D)$$

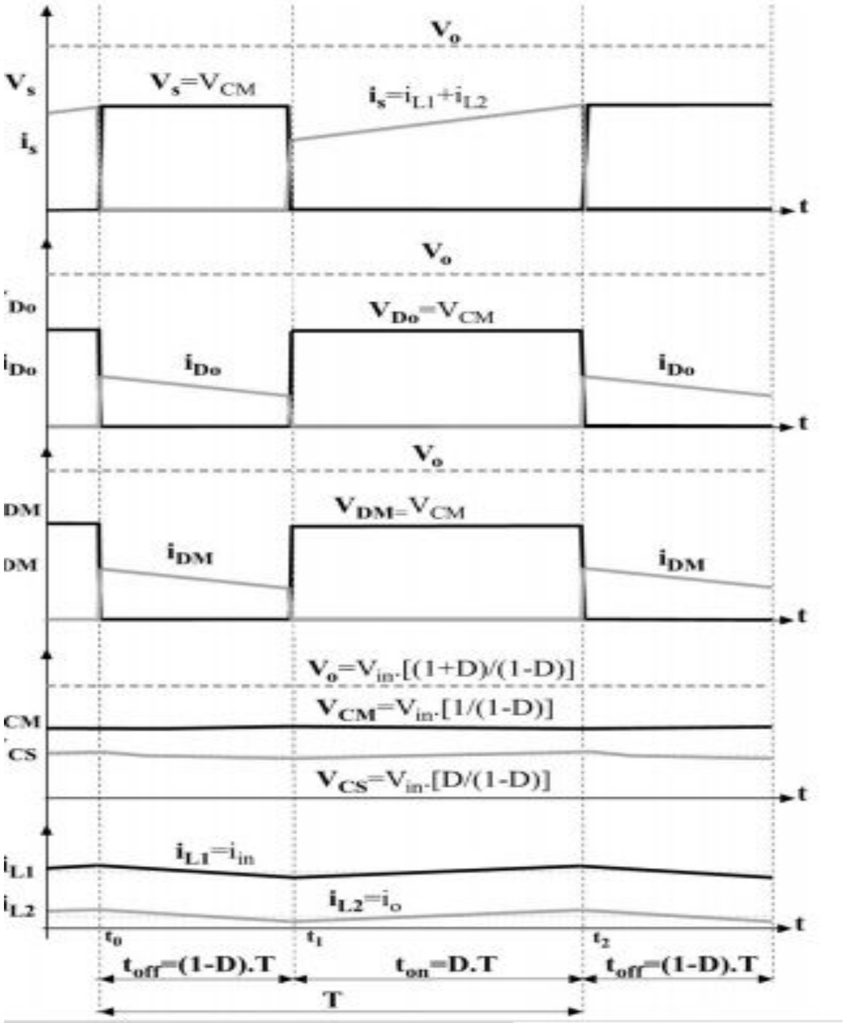
$$V_{CM}(1 + D) = V_o$$

$$\frac{V_o}{V_{CM}} = 1 + D \quad \textbf{(8)}$$

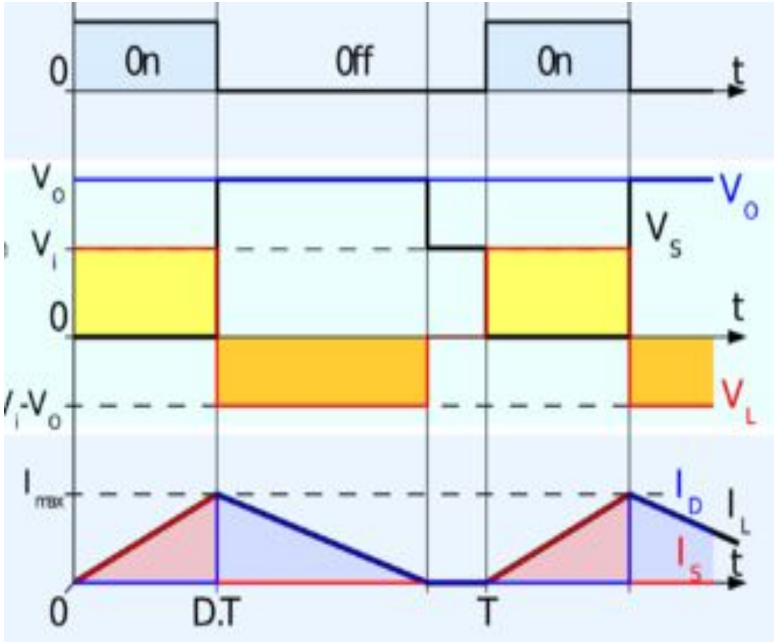
Multiplicando (6) y (8)

$$\frac{V_{CM}}{V_{in}} \cdot \frac{V_o}{V_{CM}} = \frac{V_o}{V_{in}} = \frac{1}{(1-D)} \cdot (1 + D)$$

$$\frac{V_o}{V_{in}} = \frac{(1+D)}{(1-D)}$$


Vo
Vs
Vs=VCM
is=iL1+iL2
is
t
Vo
Do
VDo=VCM
iDo
iDo
iDo
t
Vo
DM
VDM=VCM
iDM
DM
iDM
t
Vo=Vin.[(1+D)/(1-D)]
VCM=Vin.[1/(1-D)]
CM
CS
VCS=Vin.[D/(1-D)]
t
iL1=iin
iL1
iL2
iL2=io
t
t0
t1
t2
toff=(1-D).T
ton=D.T
toff=(1-D).T
T

Modo de operación discontinua



Ecuaciones de Ton

$$\Delta I_1 = \frac{V_{in}TD}{L} = I_{max} \quad (1)$$

Para Toff

$$\Delta I_1 = \frac{(V_{CM} - V_{in})\delta T}{L} \quad (2)$$

Igualando (1) Y (2), SE OBTIENE

$$\delta = \frac{V_{in}D}{V_{CM} - V_{in}} \quad (3)$$

De la corriente promedio del diodo, se tiene:

$$I_{0,prom} = \frac{I_{max} \cdot \delta T}{2T} \quad (4)$$

Reemplazando (1) en (4):

$$\frac{V_{CM}}{V_{in}} = 1 + \frac{V_{in}D^2T}{2IL}$$