E_{DC} FWR 1ϕ $\simeq$ .9 E_{rms}

full wave

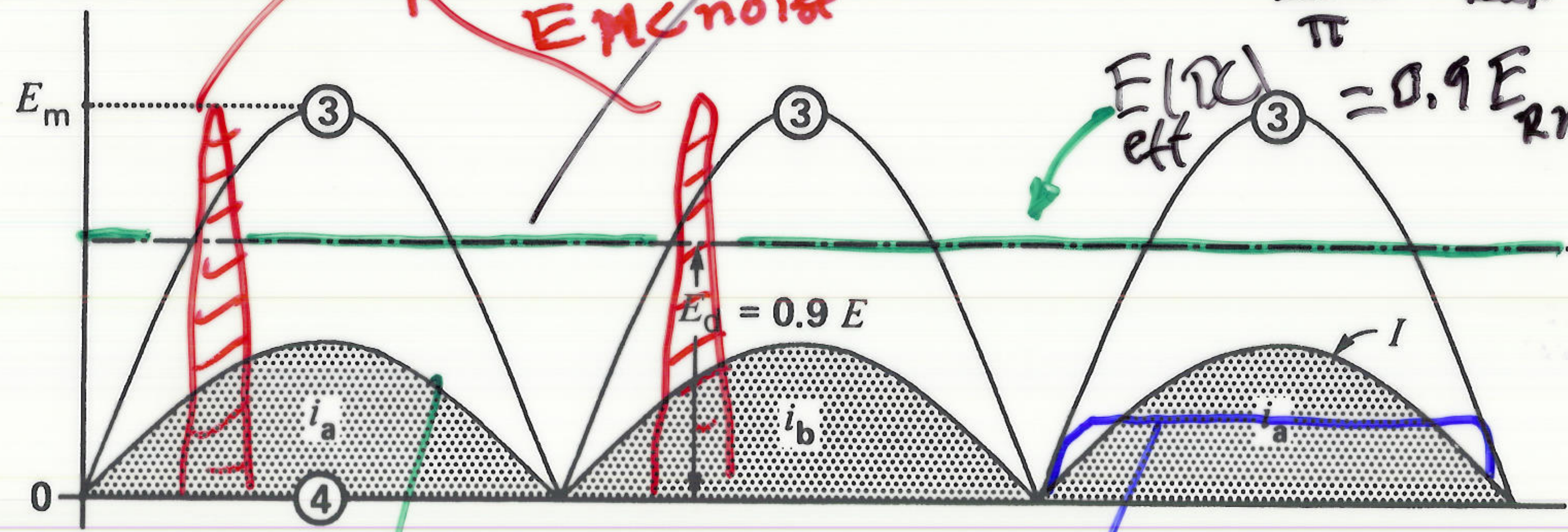
$$E_{eff}(DC) = \frac{2}{\pi} E_{pk}(1\phi)$$

$$= \frac{2\sqrt{2}}{\pi} E(Rms)$$

$$E_{eff}(DC) = 0.9\, E_{Rms}$$

i (R-C)

Spikes cause EMC noise

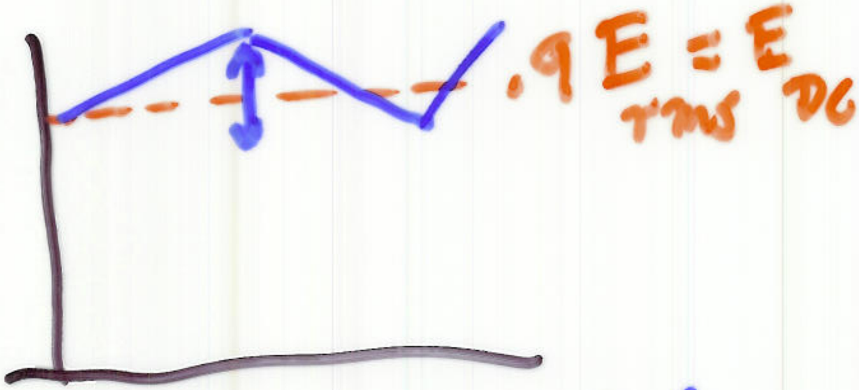


[i for small L or pure R]

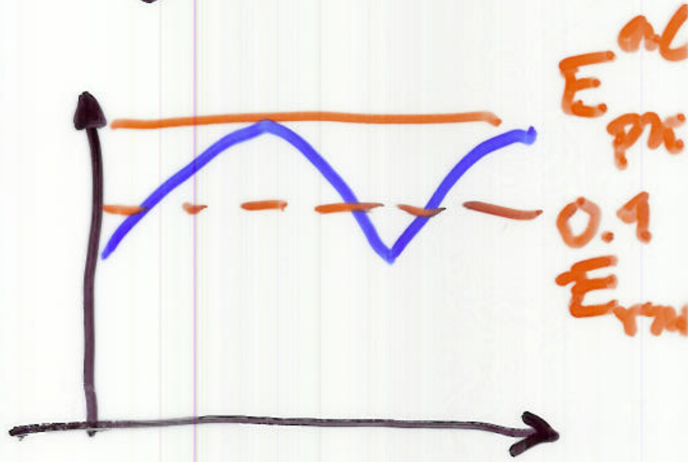
[i (L-R) for large L]

$E_{eff}(\frac{1}{2}$ Wave$) = ?$ same for all?

V_0^{DC} (R-L)



V_0^{DC} (R-C)



$$\Delta i_L = \left(\frac{E_L}{L}\right)\partial t \Bigg\} \text{for short time}$$

ΔV sinusoidal

$E > .9E_{Rms}$

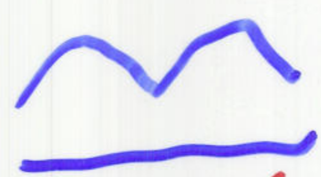
more like a Δ-wave

yet we have

$E_L^{DC} = \Delta$

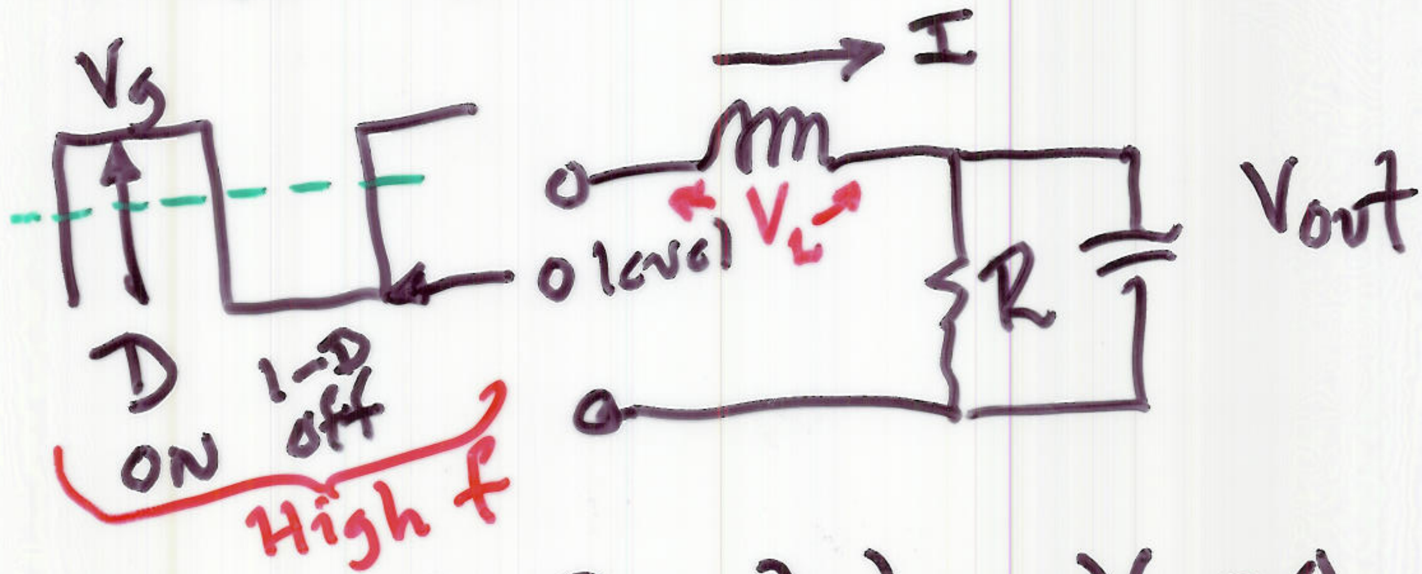
$E_R^{DC} = .9E_{Rms}$

$E_C^{DC} =$ ① E_{pk}^{AC} for large R

② 

③  for R small

Given □-wave of V_{IN}

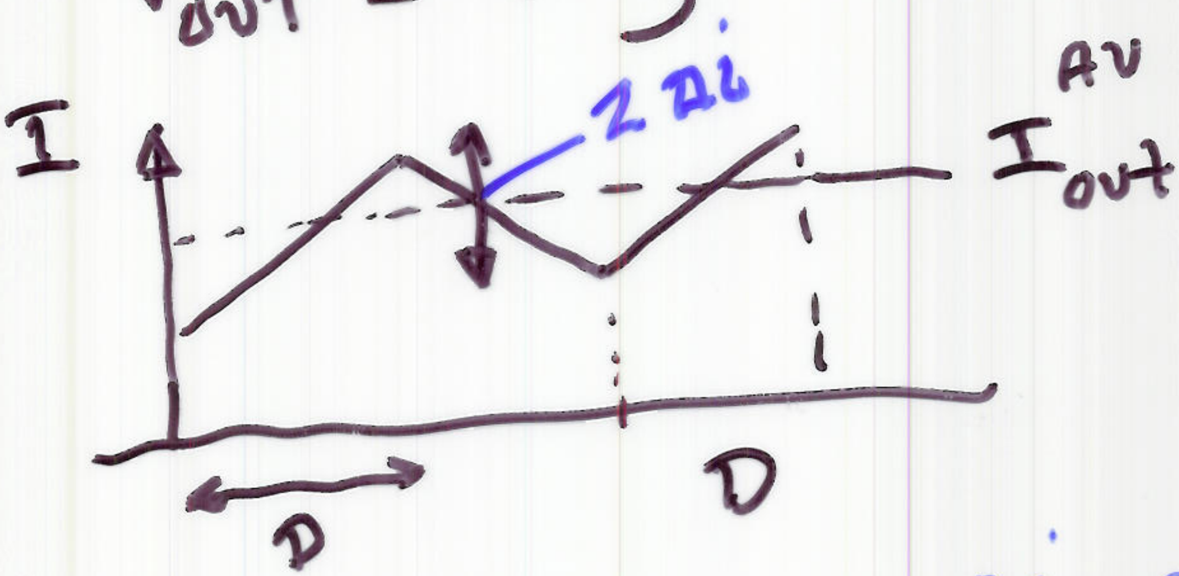


In steady state $V_L = 0$

$$V_{IN}^{AV} \equiv DV_g + \Delta V$$

$$I_{out}^{AV} = \frac{DV_g}{R}$$

$$V_{out}^{DC} = DV_g$$



Want to know $\frac{\Delta i}{I}$ factor

Chapter 21 Fundamental Elements of Power Electronics

This chapter covers such a broad range that it is impossible to sum it up in a few words. Rather, we suggest a quick glance through the Section headings to become familiar with the contents. The user-friendly presentation is arranged so that even the non-initiated will be able to understand the meaning and thrust of power electronics. No complicated mathematics, no nitty-gritty detail to mask the basic principles.

1 Distortion power factor, displacement power factor and total harmonic distortion are introduced in Sections 21.12 to 21.14. These terms have become important in today's power electronic environment.

old switch of PE ONLY

turns off @ $I=0$ or $I<0$

2 The application of thyristors has been grouped into six fundamental circuits that describe the majority of all industrial applications (Sections 21.20 to 21.25). They give the student a broad understanding of how *line-commutated* converters are used in industry. (The term *naturally-commutated* is sometimes used instead of line-commutated).

New switches CAN turn off any time any I

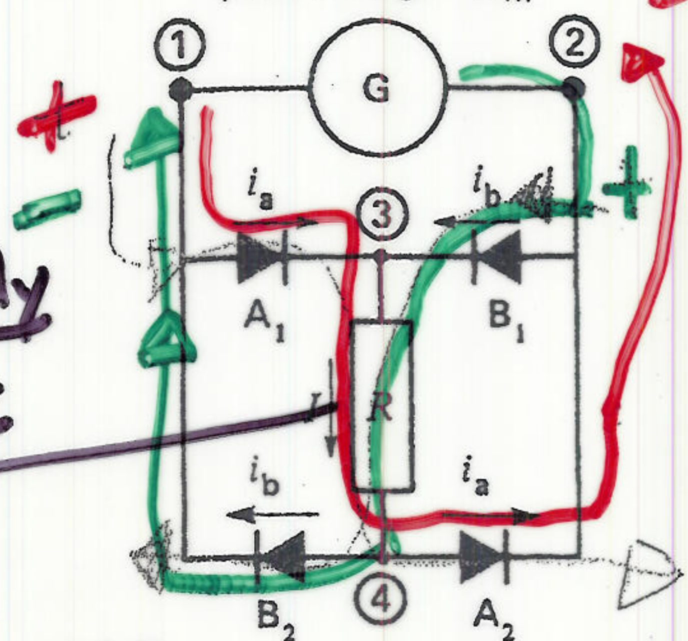
3 The development of GTOs and IGBTs has permitted the development of *self-commutated* converters that can initiate and terminate conduction at will. (The term *force-commutated*

1Φ F.W. Bridge (4 diodes)

Fig 21.13
Pg 481

Consider Loads: ① R ② R-L

peak voltage = E_m



(a)

① R_{load} only

Flow of i_R is full-wave rectified

a. Single-phase bridge rectifier.
b. Voltage levels.

Ex. Cr.
? Voltage Doubler Circuit

V_2 for I_{DC} = ?

0 ⇒ $V_0 = .9 V_{ac}$

② With load 

i_{load} → □-wave

Why? $\frac{V}{L}$ if $X_L > R$

} Our Key Approx

Gate signals control i angles

① No g_1, g_2 fully open switch

Fig 21.33
Pg 580

+V_{IN} control + i angle

AC source

−V_{IN} control −i angle set.

For timing at gates

② g_1@0
g_2@180 } Fully closed switch for all times

g_1@α

g_2@180+α

Other ③ g_1, g_2 timing is more useful

Need to Trf couple

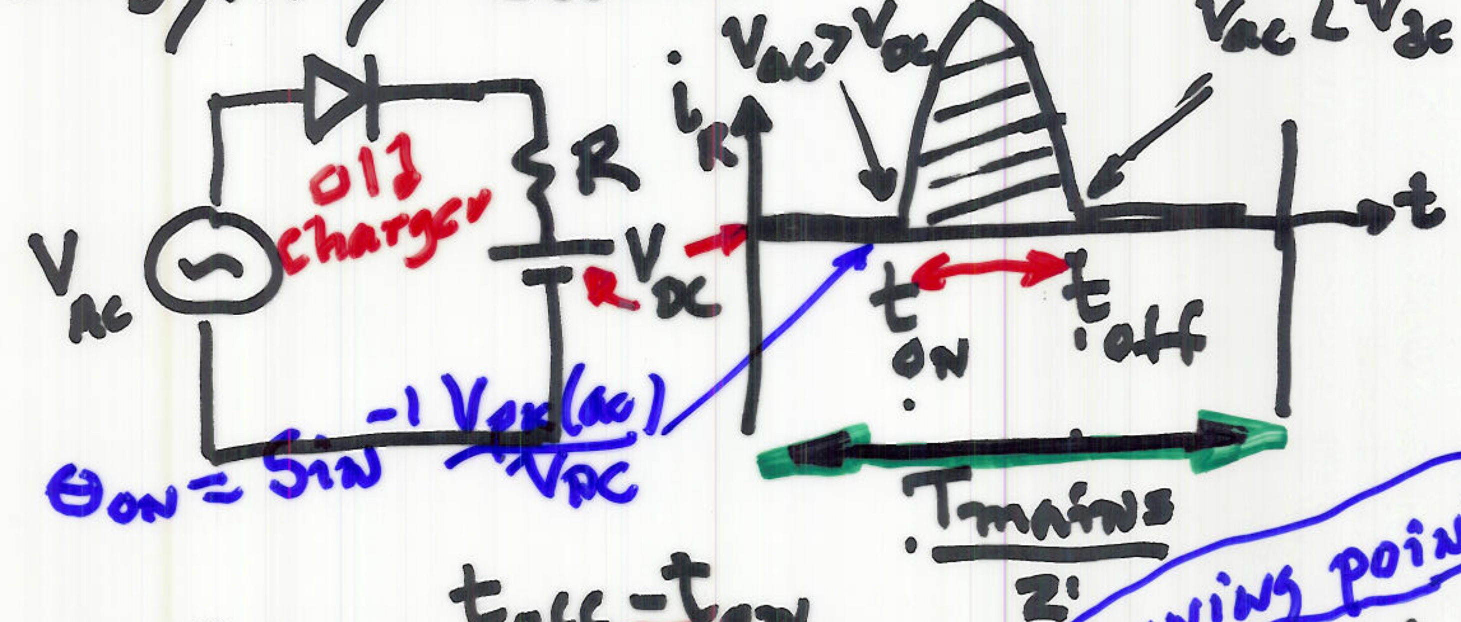
$I_{ON}[R_{ON} + V_{ON}]$ = Contactor Power loss

a. Electronic contactor.

b. Waveforms with a resistive load.

Fortunately I_{surge} of SCR ≃ 10 * I_{ac}(AV)

Diodes are now illegal When used in Battery Chargers they cause low P.F.



$$P.F. \approx \frac{t_{off} - t_{on}}{T_m/2}$$

easy fix R → L

PF ⇑ due to "L" longer Duration

i_L (peak) ~ Positive V-sec across "L"