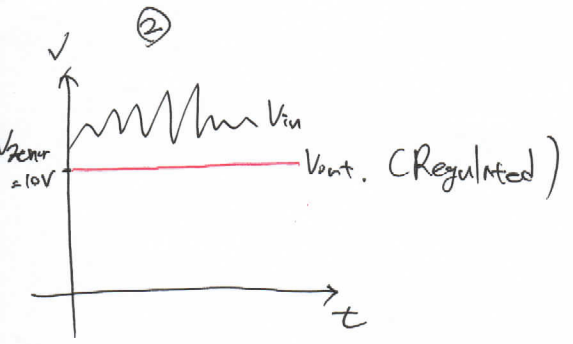
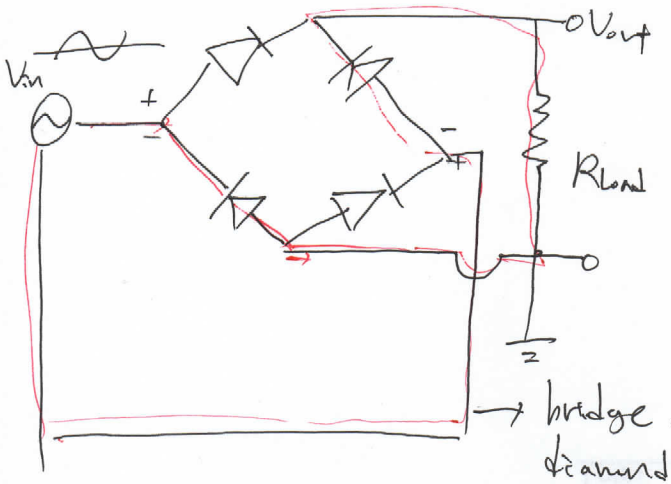
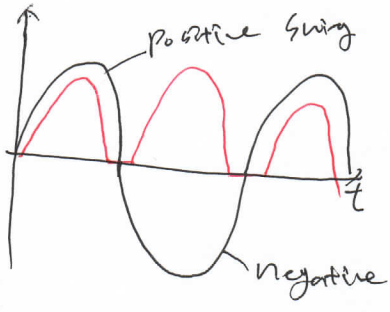



"Full wave rectifier"

"Most important application of Diode, Power Supply"

## Power supply design

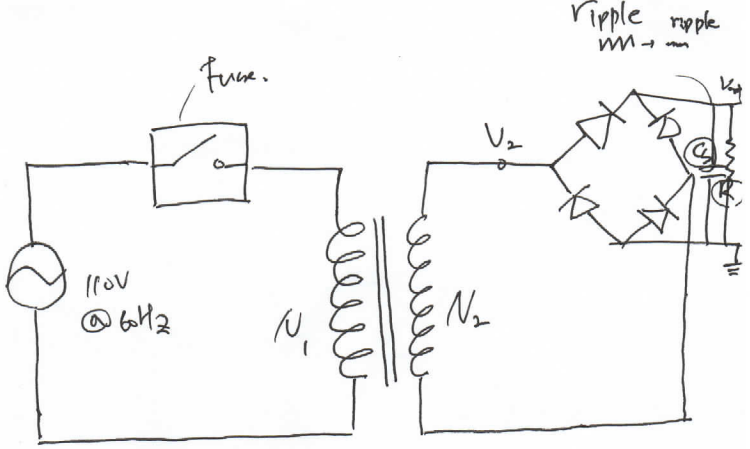
Spec) $V_{in}$ = 110V @ 60Hz

$V_{out}$ = 20V (DC)

$\Delta V = V_{ripple}$ = 10% of $V_{out}$

= 2V

$I_{max}$ = 1A.




1. $N_1 : N_2$

$N_1 : N_2 = V_1|_{rms} : V_2|_{rms}$

$= 110V : V_2|_{rms}$

$V_2|_{rms} = \sqrt{\frac{1}{T}\int_0^T V_{(t)}^2\, dt}$

$= \frac{1}{\sqrt{2}} V_2|_{peak}$.

$V_2|_{peak} = V_{out} + V_{ripple} + V_{drop}$

$= 20V + 2V + 2 \times 0.6V$

$= 23.2V$.

$V_2|_{rms} = \frac{1}{\sqrt{2}} V_2|_{peak} = 16.2V$.

$N_1 : N_2 = 110 : 16.2 \approx 55 : 8$

2. $V_2|_{peak} = 23.2V$, $I_{max} = 1A$

$\Rightarrow$ 1N914 model.

3. $C_s$ : Smoothing Capacitor

$I = C_s \frac{dV}{dt} = C_s \frac{\Delta V}{\Delta t}$,

$I = I_{max} = 1A$, $\Delta V = V_{ripple} = 2V$

$\Delta t = \frac{1}{120}$ sec. $\therefore C_s = \frac{I}{\Delta V/\Delta t}$

$= 4mF$

4. Bleeding Resistor
→ "safety reason"

$R_B C_5$ = ~~Time~~
Time for bleeding
= 4 sec. (given)

$R_B$ = 1k.

6. Fuse rating current.

$I_1 V_1 = I_2 V_2$

$I_1 (110V) = (1A)(16V)$

$I_1$ = @ 140mA.

Fuse rating current = $S_2 \times S_1 \times I_1$

$S_2$ : safety fac $S$
= 4 times for

HWt. Design a V.G (cheap, small ripple, beautiful) power supply

$V_{in}$ = 240V @ 50Hz.

$V_{out}$ = 5V

$I_{max}$ = 1A → design it!

$V_{ripple}$ ~~= 1%~~ = 10%.

10/11

# Diode.



→ ok Normal flow

← × Reverse flow

**Laws**

1. $\vec{z}(z\uparrow) = 0$

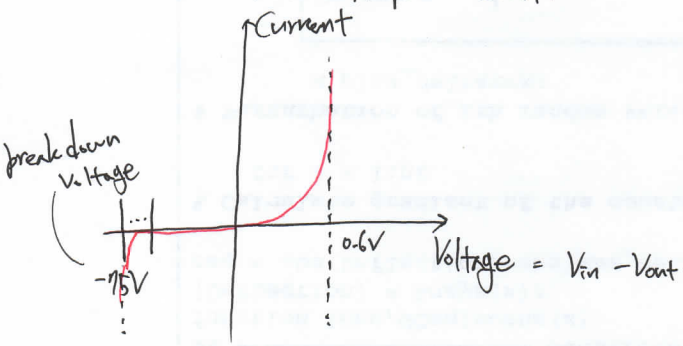
   $\overleftarrow{z}(z\downarrow) = \infty$

   ⇒ Direction control for current.

2. $V_{out} = V_{in} - 0.6V$ when current flows.

⇒ $\Delta V_{out} = \Delta V_{in}$

0.6V = Diode Prop. = Const.




$V_{out} = V_{in} - V_{out}$

I-V relationship for diode.

Application.

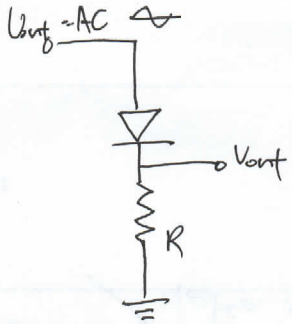
1. current diode valve.
   (Safety Circuit)
   forward flow allowed.
   reverse flow prohibited.

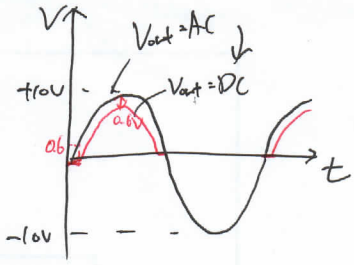
2. Clamper.
   : To pick up the range of Voltage
   $V_{in} \doteq V_{out} \leq V_c$

3. Rectifier
   AC to DC.

4. Voltage source. (≠ Power supply)

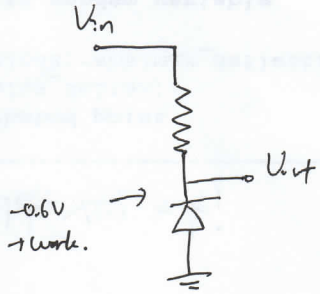
# Diode.

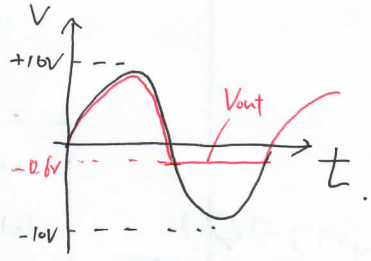



"Rectifier"

"Halfwave rectifier"



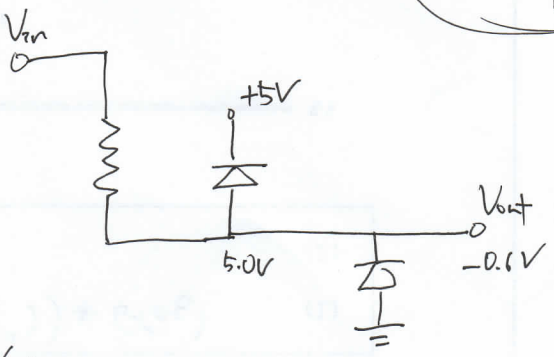



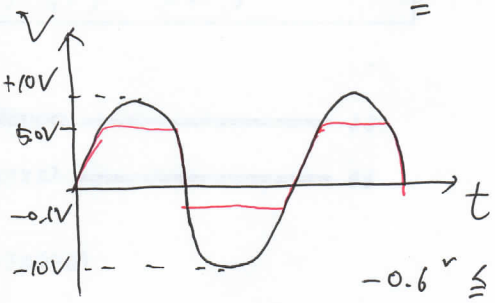

$-10V \leq V_{in} \leq +10V$

$\frac{V_{out}}{V_{in}} = \frac{Z_1}{Z_1+Z_2} = \frac{\infty}{R+\infty} = 1.$

$\therefore -0.6^V \leq V_{out}$

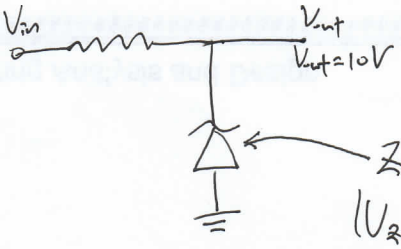
"clamper"




$-0.6^V \leq V_{out} \leq 5.0^V$

"clamper"




$|V_{Zener}| < 15V.$

Breakdown Voltage = $|V_{Zener}| = 10V, 12V,$