

$$V_{in} = 230V \pm 0/15 \Rightarrow$$

$$195V_{Ac} < V_{in} < 265V_{Ac} \quad (1)$$

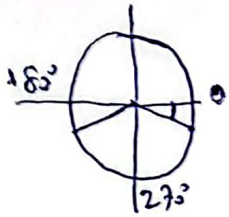
$$195 \times \sqrt{2} = 276V \quad V_{rim} = 0,8$$

$$\Delta V_{CAP} = 0/15$$

$$276 \times 0,85 = 235V$$

$$276 \sin(\omega t) = -235V$$

$$\Rightarrow \omega t = -58,37^\circ, \boxed{238^\circ}$$



$$\Delta t = \frac{238 - 90}{180} \times 10ms = 8,22ms$$

$$V_{(ort)} = \frac{276 + 235}{2} = 255V$$

$$I_{CAPDESARG} = \frac{15W/0,8}{255} = 74mA$$

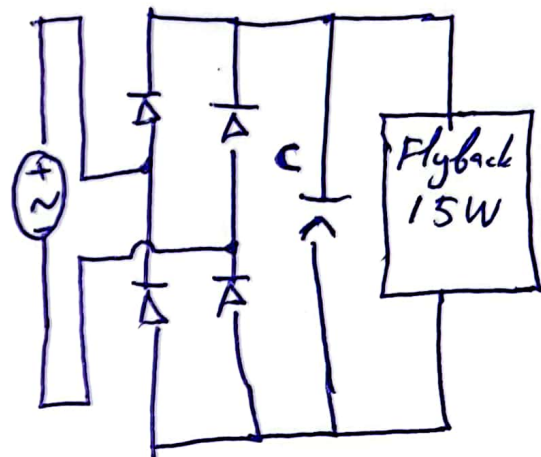
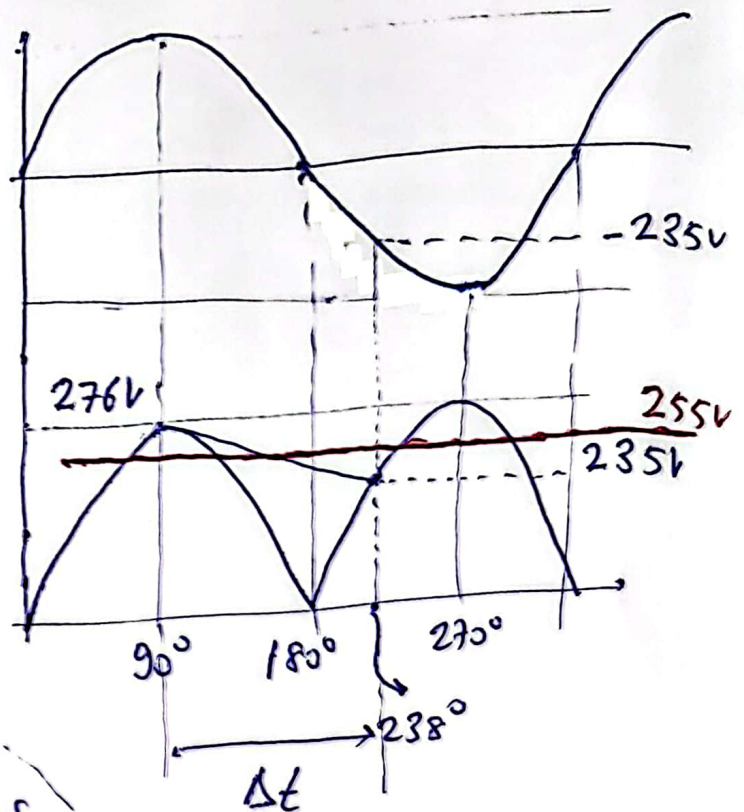
$$\Delta V = 276 - 235 = 41V$$

$$\frac{74mA}{C} \cdot 8,22ms = 41V$$

$$\Rightarrow C = 148\mu F$$

$$\Rightarrow \boxed{15\mu F \text{ yoda } 22\mu F}$$

400V CAP sensitiv



$$230V_{Ac} \pm 0/15 \Rightarrow \frac{1\mu F}{1W}$$

Universal input  $\Rightarrow \frac{2\mu F}{1W}$

#  $D, L, I_{Lp}$  #  
 $V_{\text{gansiyen}} = 15 \times 6 = 90V$

$$235 \times D = 90 \times (1 - D)$$

$$\Rightarrow D = 0,277$$

$$P_{in} = \frac{P_o}{\eta} = \frac{15}{0,8} = 18,75W$$

$$D = \sqrt{\frac{2 \times P_{in} \times L}{T}} \cdot \frac{1}{V_{in}}$$

$$0,277 = \sqrt{\frac{2 \times 18,75 \times L}{10 \cdot 10^{-6}}} \cdot \frac{1}{235}$$

$$\Rightarrow L = 1,129mH$$

$$\frac{1}{2} L \cdot I_{Lp}^2 \cdot f = P \quad I_{Lp} = I_{Lpeak}$$

$$\Rightarrow \frac{1}{2} \cdot 1,129 \cdot 10^{-3} \cdot I_{Lp}^2 \cdot 100000 = 18,75W$$

$$\Rightarrow I_{Lp} = 0,576A$$

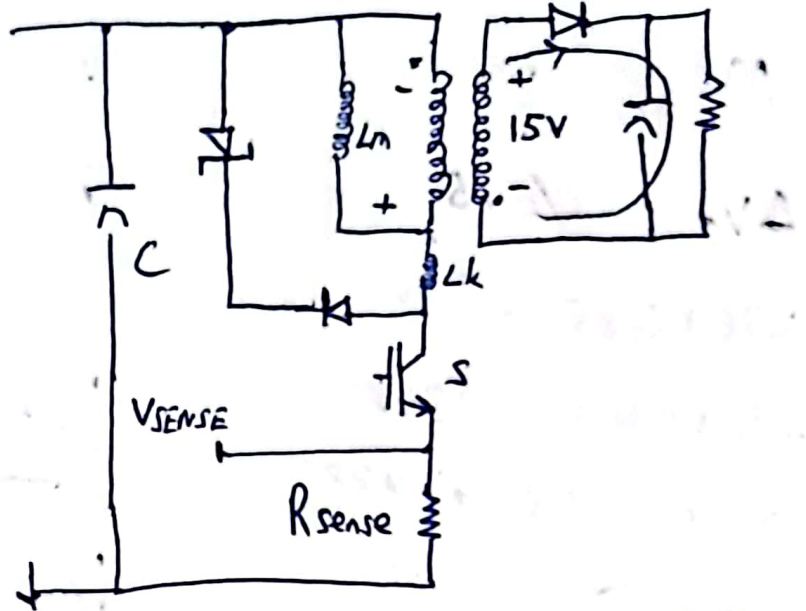
#  $I_S(RMS), I_C(RMS), I_{Pr}(RMS)$  #

$$V_{CC(ORT)} = 255V$$

$$\frac{255}{1,129mH} \cdot D_{ORT} \cdot 10 \cdot 10^{-6} = 0,576A$$

$$1,129mH$$

$$\Rightarrow D_{ORT} = 0,255$$



$$\rightarrow I_S(RMS) \approx I_{Pr}(RMS) = I_{RSENSE}(RMS) \quad (@ 100kHz)$$

$$= \frac{1}{\sqrt{3}} \cdot I_{peak} \cdot \sqrt{D_{ORT}}$$

$$= \frac{1}{\sqrt{3}} \cdot 0,576 \cdot \sqrt{0,255} = 0,17A_{RMS}$$

#  $R_{SENSE}$  #

$$V_{SENSE} = 1V \Rightarrow B_{COAE} = 0,3T$$

$$V_{SENSE} = 0,666T \Leftarrow B_{CORE} = 0,2T$$

$$R_{SENSE} = \frac{V_{SENSE}}{I_{Lpeak}} = \frac{0,666}{0,576} = 1,157\Omega$$

$$P_{RSENSE} = 0,17^2 \cdot 1,157 = 0,033W$$

$$2,2\Omega \parallel 2,2\Omega = 1,1\Omega$$

Hoseyin Yesilyurt

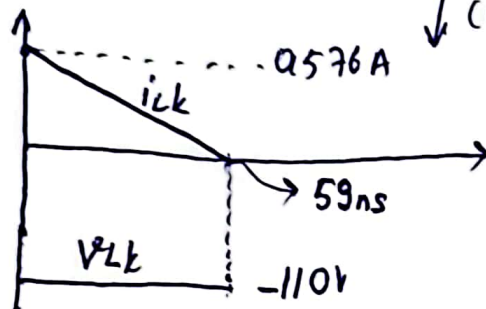
(2)

Snubber Gücü # #TVS Diyarı #

$$L_k = 0,01 \times 1,129 \text{ mH} = 11,29 \mu\text{H}$$

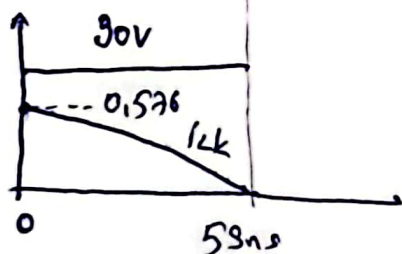
$$\frac{1}{2} L_k \cdot I_{Lp}^2 \cdot 1000000 = 0,187 \text{ W}$$

$$P_{\text{snubber}} > 0,187 \text{ W}$$

NET Hesap  
(Detay)

$$i_{Lk} = 0,576 - \frac{110}{11,29 \mu\text{H}} \cdot t$$

$$i_{Lk} = 0 \Rightarrow \Delta t = 59 \text{ ns}$$



59 ns

$$\int 90 \times (0,576 - 9,743 \cdot 10^6 \cdot t) dt$$

$$= 90 \times 0,576 \times 59 \cdot 10^{-9} - 90 \times 9,743 \cdot 10^6 \cdot \frac{(59 \cdot 10^{-9})^2}{2}$$

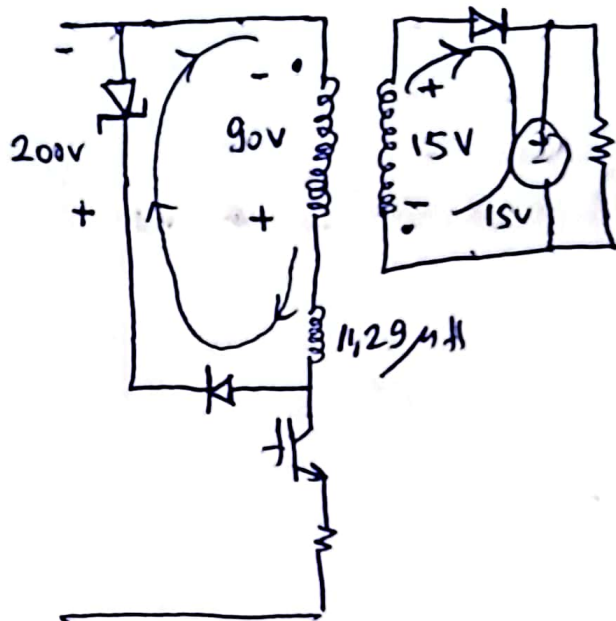
$$= 1,532 \mu\text{Joule}$$

$$P_{\text{snubber}} = 100000 \cdot \left[ \frac{1}{2} \cdot 11,29 \cdot 10^{-6} \cdot 0,576^2 + 1,532 \mu\text{J} \right]$$

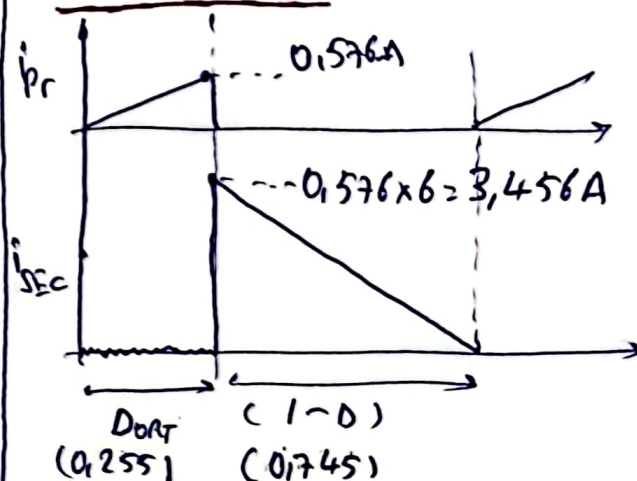
$$= 0,34 \text{ W}$$

$$R_{\text{OTA}} = 75^\circ\text{C/W}$$

$$\Delta T = 75 \times 0,34 = 25,5^\circ\text{C}$$



# I SECC(RMS) #



$$I_{\text{SECC(RMS)}} = \frac{1}{\sqrt{3}} \times 3,456 \times \sqrt{0,745}$$

$$= 1,722 \text{ A(RMS)}$$

mosfet parasitik cap siki  
hizli sag aldogu kelim edibi



>1k15 Ayodu#

$$264 \cdot \sqrt{2} = 373V$$

$$373/6 = 62,22V$$

$$V_{D(peak)} = 62,22 + 15 = 77,22V$$

200V uygun. SB3200.

$$I_{D(ORT)} = I_0 = 1A$$

$$R_{\theta JA} = 25^{\circ}C/W$$

$$V_F = 0,8V$$

$$P_{loss D} = 0,8 \times 1 = 0,8W$$

$$\Delta T = 0,8 \times 25^{\circ}C = 20^{\circ}C$$

# MOSFET #

$$V_{DS(MAX)} = 373 + 200 = 573V$$

NTD 360M80S3Z

800V, 360m $\Omega$ , 13A, DPAK,  $Q_g = 25nC$   
@ 6,5A, 400V

$$I_{SCRMS}^2 \cdot 0,36 = 0,17^2 \cdot 0,36 = 0,01W$$

Turn off kayıpları düşük. ( $\approx 0,35W$ )

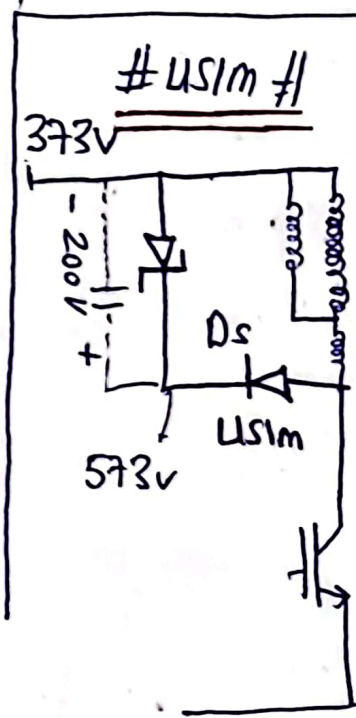
DPAK kutucuktur. Isınma olursa frekans düşürülür

$$R_{\theta JA} = 62,5^{\circ}C/W$$

$$\Delta T = 62,5 \times 0,36 \approx 22,5^{\circ}C$$



Not: Şekil göce limitlenmek  
isteyince  $R_{sense} = 33\Omega$  33R  
yapılabilir. Kontrol devresini  
besleyebilecek birün yde



$$V_{DS(peak)} = 573V$$

$$V_{USLM} = 1000V$$

$$V_{DS(RMS)} < V_{USLM(RMS)}$$

1 KAF0 #

$$L_k < 11,29 \mu H$$

(4)

Primer: Sekonder (n)	Po	I <sub>pr</sub> (Rms)	I <sub>sec</sub> (Rms)	L <sub>pr</sub>	I <sub>Lpeak</sub>
6	15W	0,17A Rms	1,722A Rms	1,129mH	0,576A

Bastançısı  $\Rightarrow$  EF25: 32W @100kHz  $A_e = 51,8 \text{ mm}^2$   $A_w = 95,3 \text{ mm}^2$

$$L \cdot I = N \cdot \phi, \quad L \cdot I = N \cdot B \cdot A_e$$

$$1,129 \text{ mH} \cdot 0,576 = N \cdot 0,27 \cdot 51,8 \cdot 10^{-6} \Rightarrow N_{pr} = 63 \quad N_{pr} : N_{sec}$$

$$J = 5 \text{ A/mm}^2 \text{ seçilsin. } 3 < J < 8 \quad 66 : 11 \text{ seçilsin.}$$

$$5 \text{ A} \rightarrow 1 \text{ mm}^2$$

$$0,17 \text{ A} \rightarrow 0,034 \text{ mm}^2 \Rightarrow \phi = 0,22 \text{ mm. (Primer Kesit)}$$

$$A_{cu} = 0,038 \text{ mm}^2$$

$$I_{sec(Rms)} = 1,722 \text{ A Rms}$$

$$5 \text{ A} \rightarrow 1 \text{ mm}^2$$

$$1,72 \text{ A} \rightarrow 0,344 \text{ mm}^2 \Rightarrow 94 \text{ mm}^2 \times 3 \quad (\text{Sekonder Kesit})$$

(0,66 mm  $\phi$  bilmek zor olabilir.  
Deri etkisi de var.  
0,5 mm üzerine sığmıyordum)

$$A_{cu} = 0,377 \text{ mm}^2$$

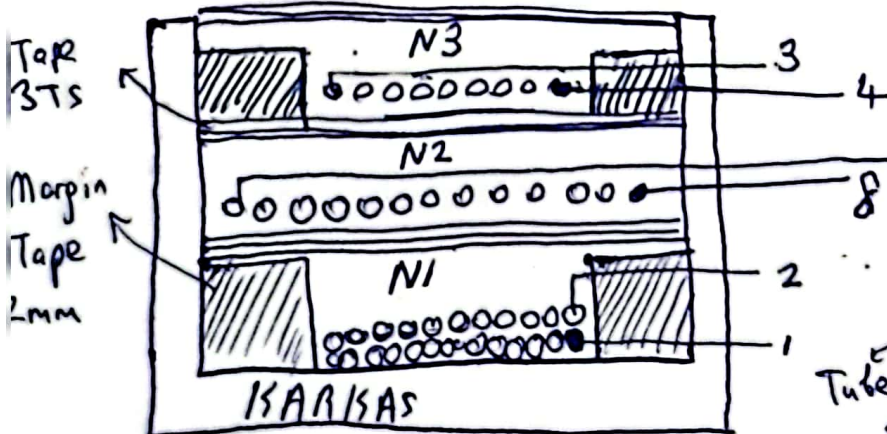
$$A_{cu} = 66 \times 0,038 + 11 \times 0,377 = 6,655 \text{ mm}^2$$

$$\text{Sarm faktörü} = (A_{cu}/A_w) \times 100 = 6,655/95,3 = 0,07$$

0,07 < 0,025 rahat sığar. Nüve küçületebilir. (iterasyon)

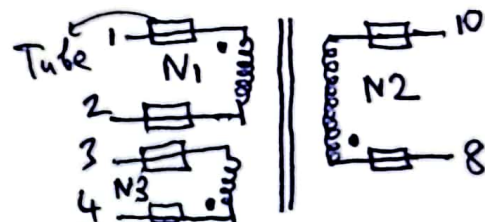
#Ömet Kesit #

$$N1: 66 \text{ TS} \times 1 \text{ P} \times 0,22 \text{ mm } 24 \text{ EWF}$$



$$N2: 11 \text{ TS} \times 3 \text{ P} \times 0,4 \text{ mm } 7 \text{ IW}$$

$$N3: 11 \text{ TS} \times 1 \text{ P} \times 0,2 \text{ mm } 24 \text{ EWF}$$



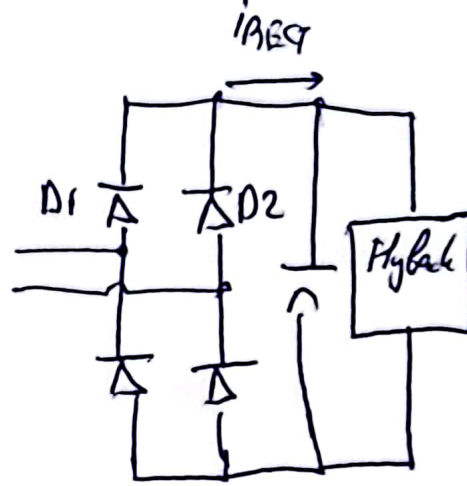
# Köprü Diyot #

$$P = 18,75W$$

$$V_{CAP(CORT)}(min) = 255V$$

$$I_{BEG(CORT)} \approx \frac{18,75}{255} = 74mA$$

$$I_{D(CORT)} = I_{D2(CORT)} = \frac{74mA}{2} = 37mA$$



$$P_{D1} \approx 37 \cdot 10^{-3} \times 1 = 0,037mW \rightarrow 82m \quad R_{QJA} = 53^{\circ}C/W \quad \Delta T \leq 2^{\circ}C$$

$$4 \times P_{D1} = 4 \times 0,037mW = 0,148mW$$

DFIOS

$$R_{QJA} = 40^{\circ}C/W \quad \Delta T = 0,148 \times 40 = 5,92^{\circ}C$$

# NTC - Common mode choke #

$$I_{(nCRMS)} \approx \frac{18,75W}{195V_{RMS}} \cdot \frac{1}{0,7} = 137mA_{(RMS)}$$

$$NTC = B57153S0100 \quad 10\Omega, \quad C_{Test} = 100\mu F @ 230V_{AC}$$

$$R_{NTC} \approx 4\Omega @ 137mA \quad T_{NTC} \approx 60^{\circ}C @ 4\Omega$$

$$Common mode \Rightarrow 0,7A \quad 39\mu H \quad 33\mu H : \text{kesek} \quad R = 1,1\Omega$$



# UC3842 - UC3844 PWM Kontrolcü

$I_{UC3842(8944)max} = 0,5mA$   
(Startup) 373V

$I_{store}$

ES20

$$P_{R(max)} = \frac{(373-15)^2}{3 \cdot 100k}$$

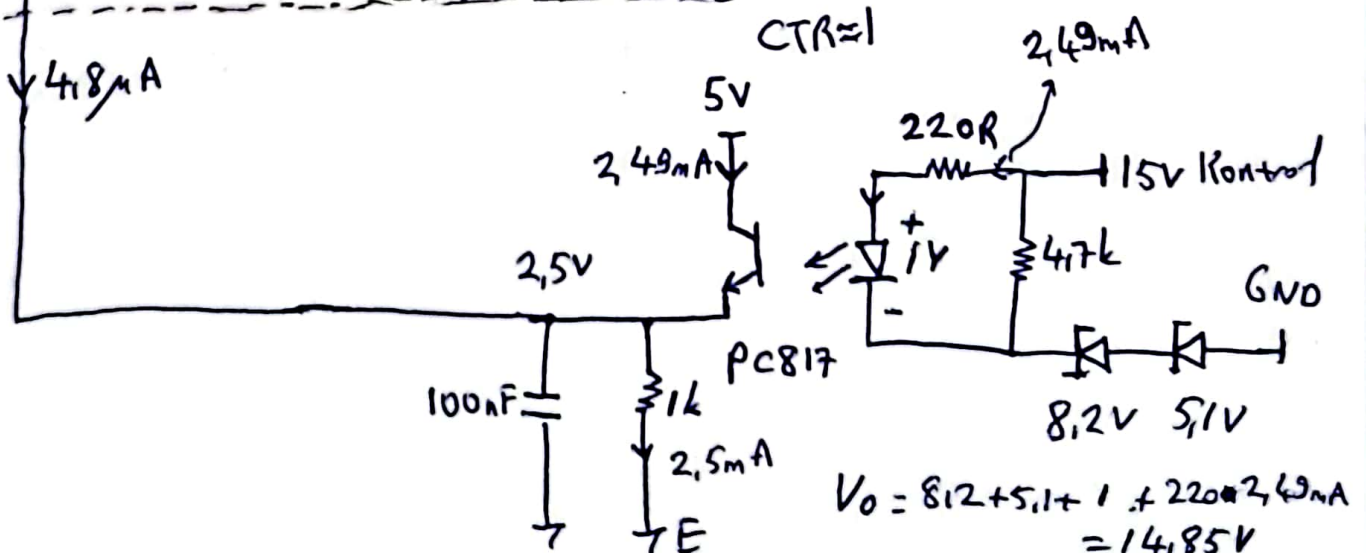
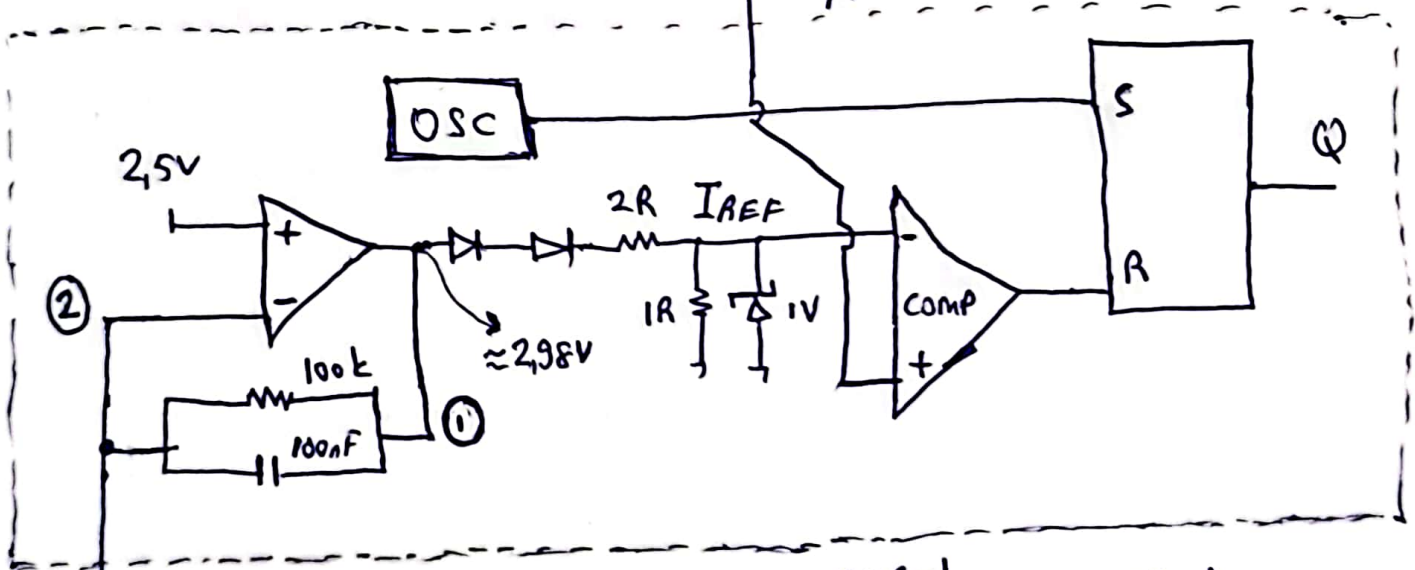
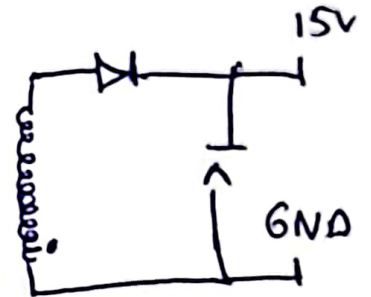
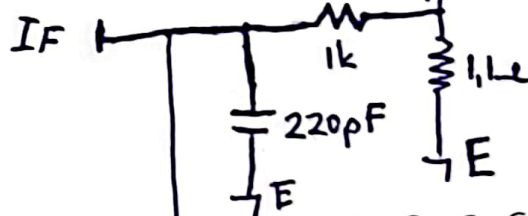
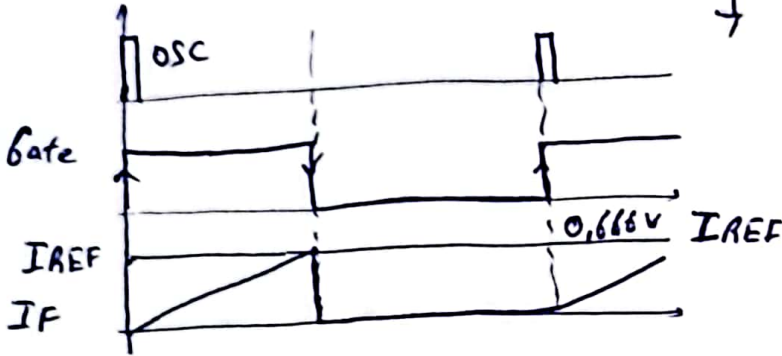
$$= 0,142W$$

$$V_{R1206} = 150V - 200V$$

$$264\sqrt{2} = 373V$$

$$I_{start(min)} = \frac{155\sqrt{2}}{300k} = 0,92mA$$

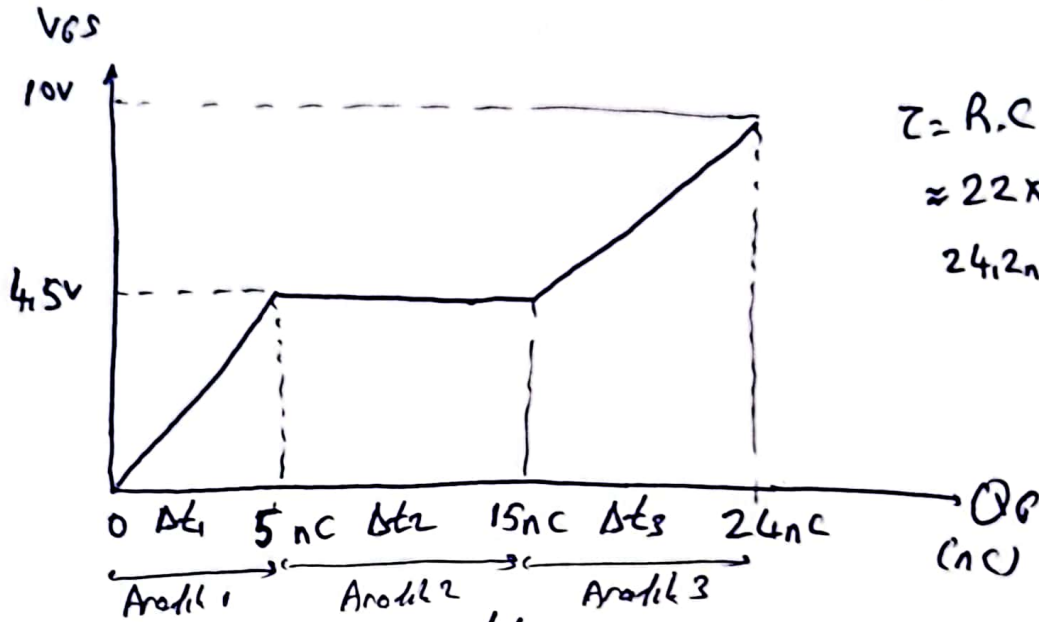
$0,92mA > 0,5mA$



## MOSFET Gate Sargı

②

NT036N80S32, 800V, 360m $\Omega$ ,  $C_{iss} = 1143\text{pF}$  @  $V_{DS} = 400\text{V}$   $V_{GS} = 0\text{V}$   
 $f = 250\text{kHz}$



$$Z = R.C$$

$$\approx 22 \times 1,1\text{nF}$$

$$24,2\text{ns}$$

Aralık 1  $V_{GS} = 15 - 15 \cdot e^{-t/\tau} = 4,5\text{V} \Rightarrow \Delta t_1 = 8,6\text{ns}$

yada  $V_{GS(\text{ORT})} = \frac{4,5 + 0}{2} = 2,25$   $I_{\text{gate}} = \frac{15 - 2,25}{22} = 0,58\text{A}$

$0,58\text{A} \times \Delta t_1 = 5\text{nC} \Rightarrow \Delta t_1 = 8,6\text{ns}$

Aralık 2

$I_{\text{GATE}} = \frac{15 - 4,5}{22} = 0,477\text{A}$   $0,477\text{A} \times \Delta t_2 = 10\text{nC} \Rightarrow \Delta t_2 = 20,95\text{ns}$

Aralık 3

$V_{GS(\text{ORT})} = \frac{10 + 4,5}{2} = 7,25\text{V}$   $I_{\text{GATE}} = \frac{15 - 7,25}{22} = 0,352\text{A}$

$0,352\text{A} \times \Delta t_3 = 9\text{nC} \Rightarrow \Delta t_3 = 25,54\text{ns}$

$\Delta t_1 + \Delta t_2 + \Delta t_3 = 55\text{ns}$

UC3842 output rise time = 150ns (max.)  $150\text{ns} > 55\text{ns}$

Gate sargı 150ns (max.) sorun  $150\text{ns} < 10\mu\text{s}$