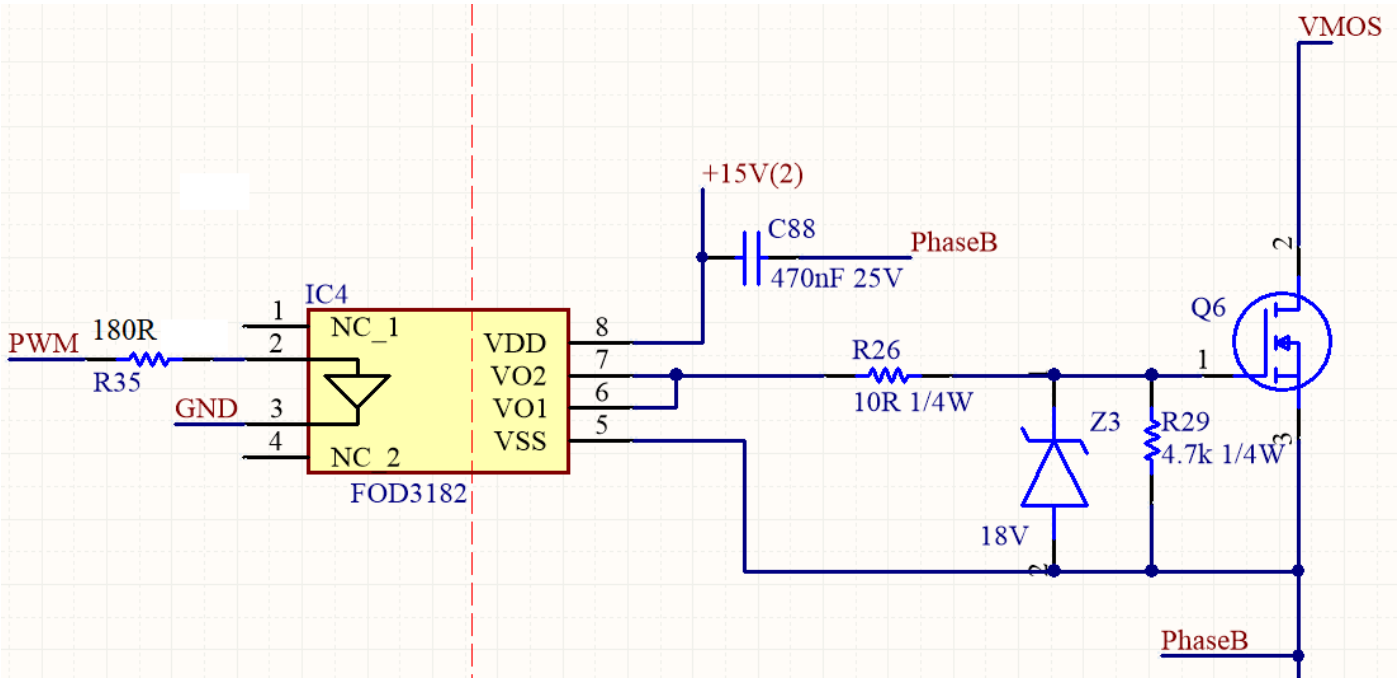
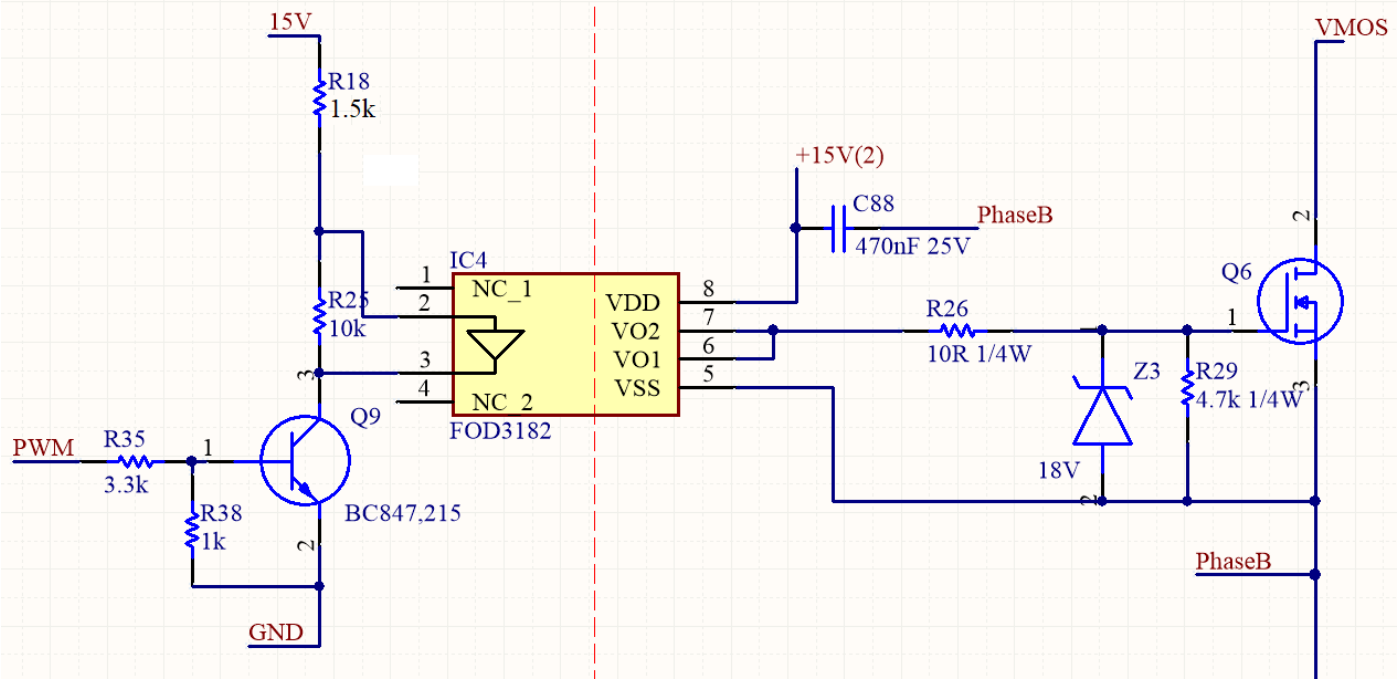
OPTOLU SÜRME



Şekil 1

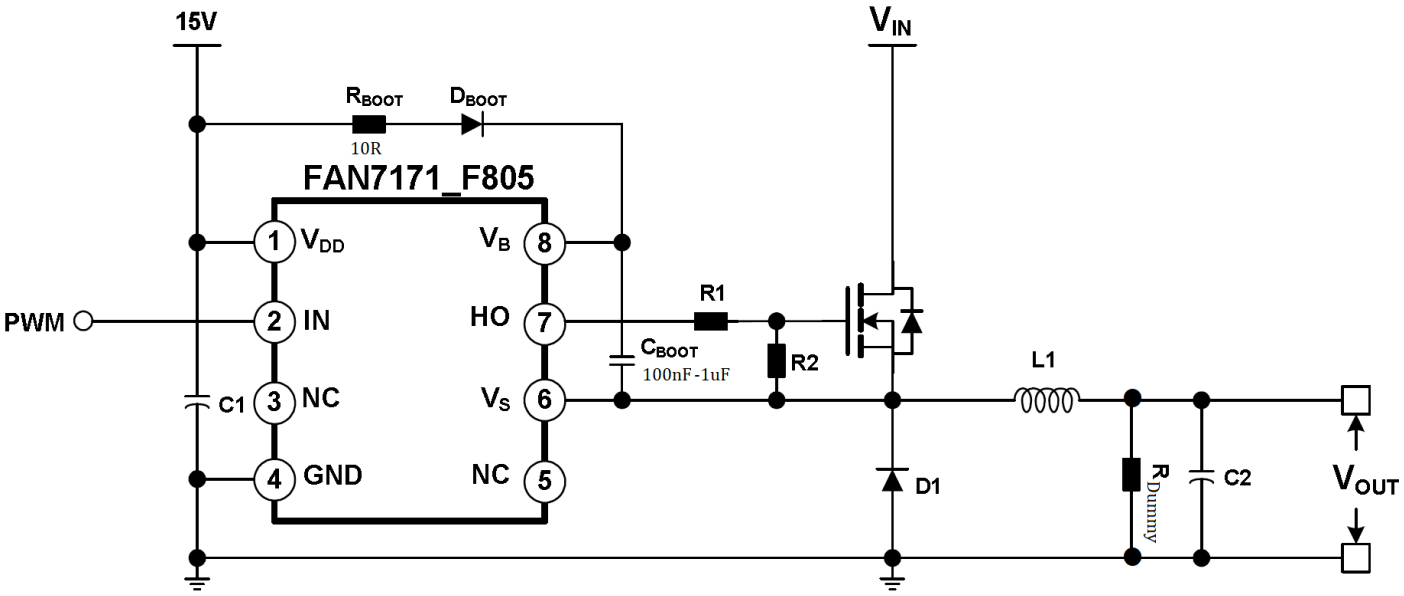


Şekil 2

Dezavantajları
Yüksek sürme akımı
İzoleli sürme gerilimi ihtiyacı
Maliyet

Avantajları
PCB tasarımı açısından kolay uygulanabilir.
İzolasyon
Doluluk oranı (D) 1 olabilir.

High Side Sürme

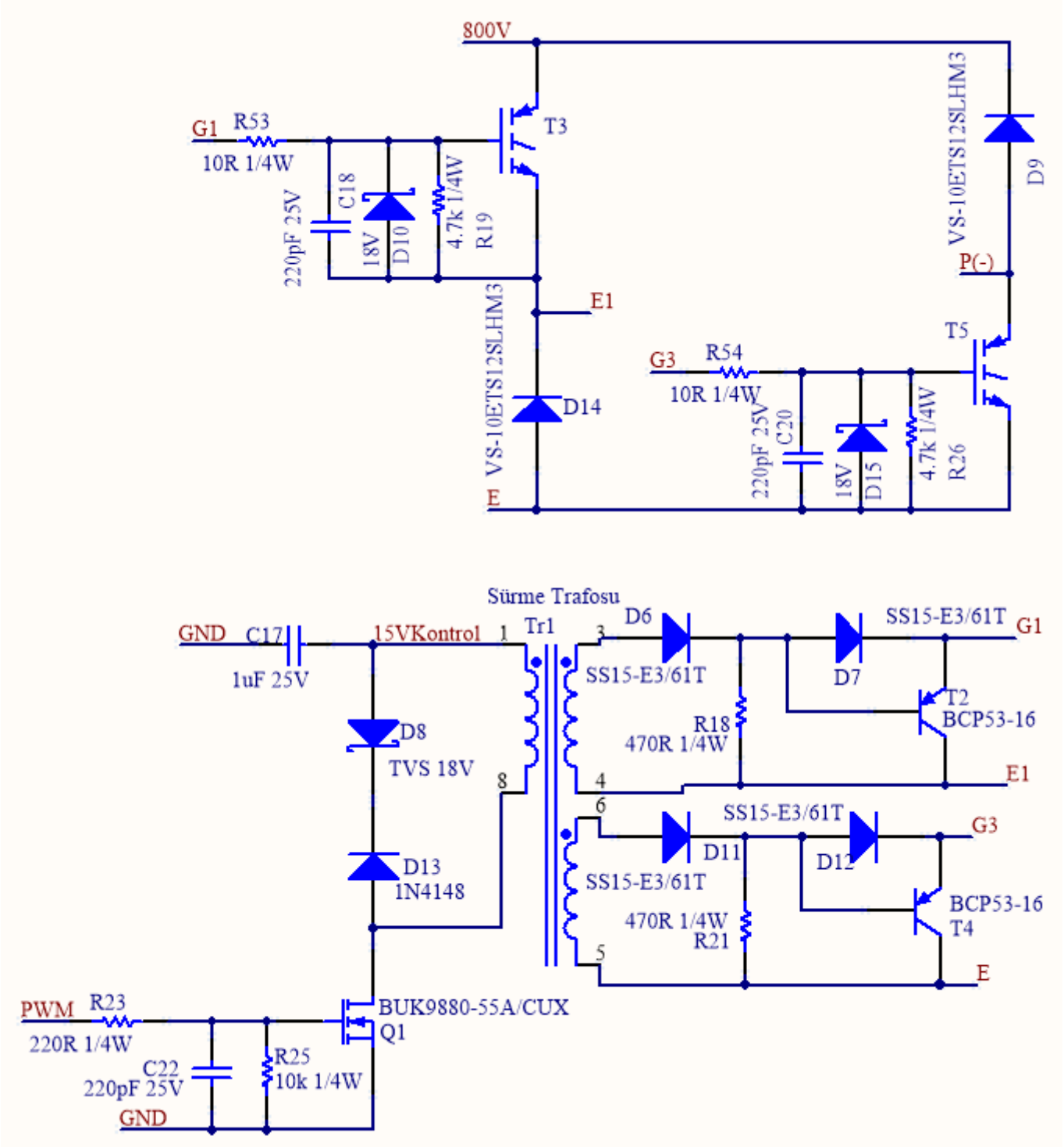


Şekil 3

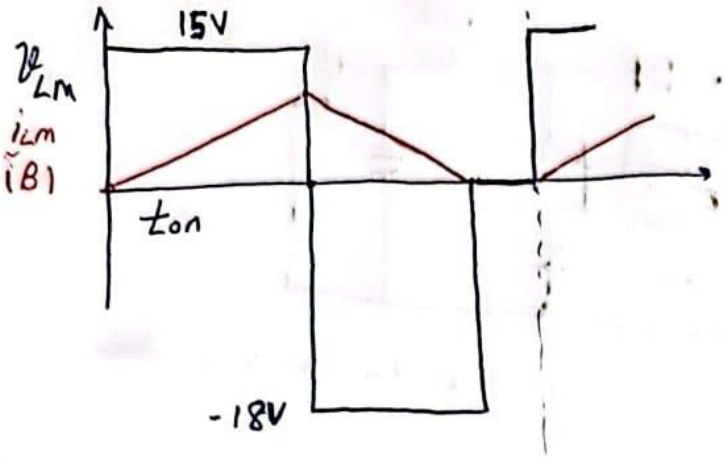
Dezavantajları
V_s pininin negatife düşme ihtimali
Yüksüz çalışması problemlidir.
Max. doluluk oranı (D) sınırlı.
Gate-Source gerilimi, giriş geriliminden daha düşük değere dolar.
PCB tasarımı açısından uygulaması daha zor.
İzolasyon yok.

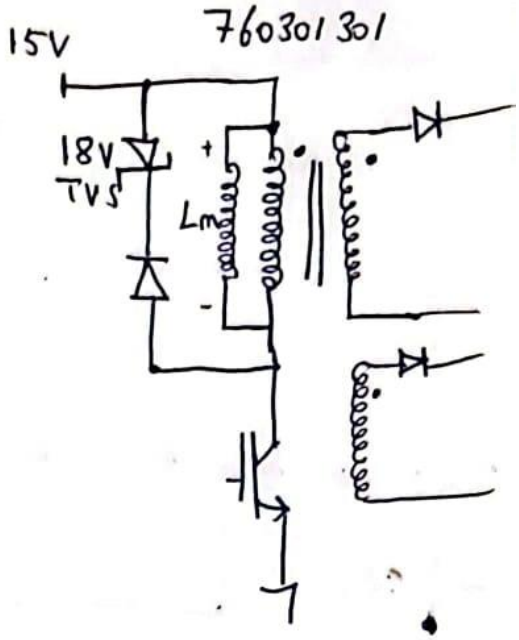
Avantajları
Maliyeti düşük.

Trafolu Sürme (2 Anahtarlı İleri Yönlü Dönüştürücü)



#2 Anahtarlı FW Dönüştürücü Sürme Trafosu





$D_{max} = 0,5$ $f = 100kHz$ $L_m = 750\mu H$

$t_{on(max)} = 5\mu s$ $i_{Lm(peak)} = \frac{15}{750\mu H} \cdot 5\mu s = 0,1A$

$P_{(TVS)} = 100.10^3 \cdot \frac{1}{2} \cdot 750\mu H \cdot (0,1)^2 = 0,375W$

SMBJ18A uygun

Volt-μs = 15.5μs = 75Vμs (

(Trafonun izolasyon durumuna da dikkat)

İzolasyon mesafesini arttıralım.

Nüve ⇒ EF20 $A_e = 32,2mm^2$ $A_L = 1540nH/N^2$ $A_w = 61,8mm^2$

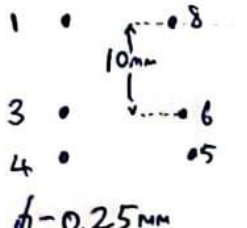
- Doyum açısından

$N \cdot \frac{d\phi}{dt} = V \Rightarrow N \cdot d\phi = N \cdot dt \Rightarrow N \cdot \Delta\phi = V \cdot \Delta t \Rightarrow N \cdot \Delta B \cdot A_e = V \cdot t_{on}$

$\Rightarrow N \cdot 0,25 \cdot 32,2 \cdot 10^{-6} = 15 \cdot 5\mu s \Rightarrow N = 9,3 \Rightarrow N = 10$

- Endüktans açısından.

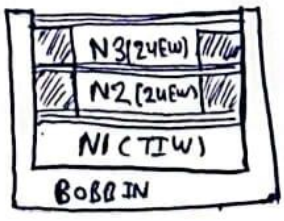
$N^2 \cdot A_L = N^2 \cdot 1540 = 750\mu H \Rightarrow N = 22$ <u>N=22 seçilir</u>

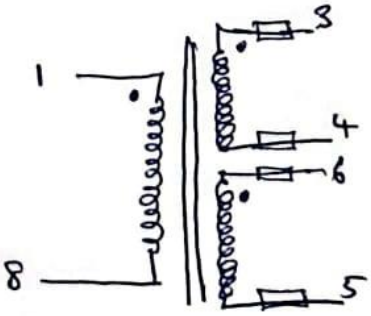


$\phi = 0,25mm$

$A_{Cu} = (\frac{0,25^2}{2}) \cdot \pi = 0,05mm^2$

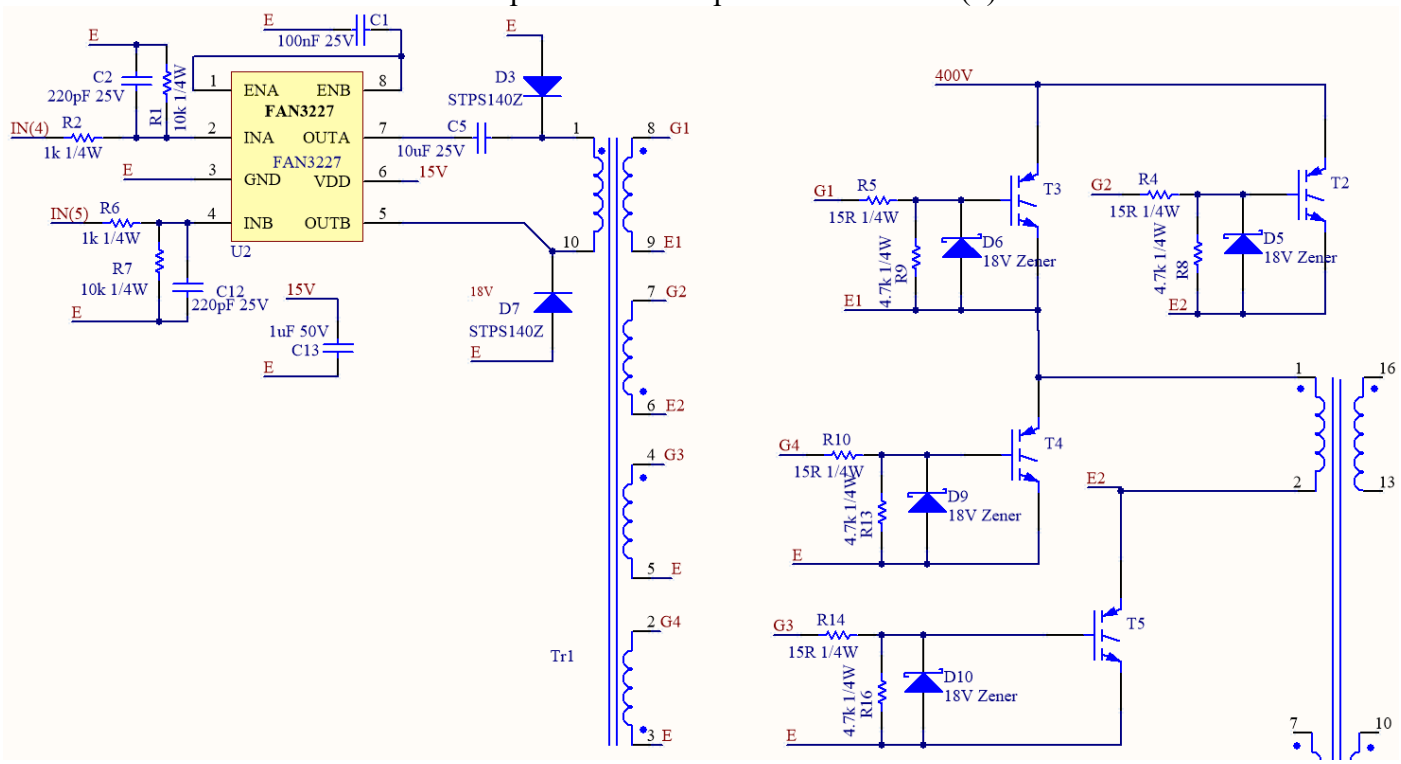
$3 \times 22 \times 0,05mm^2 = 3,3mm^2$

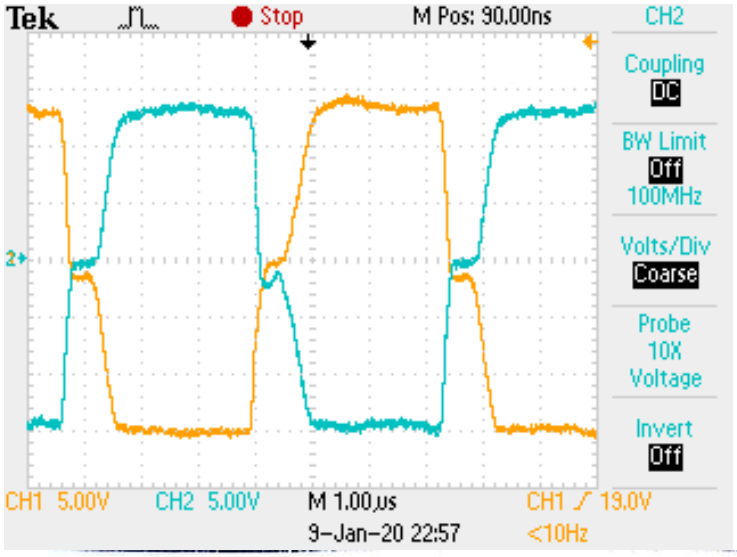




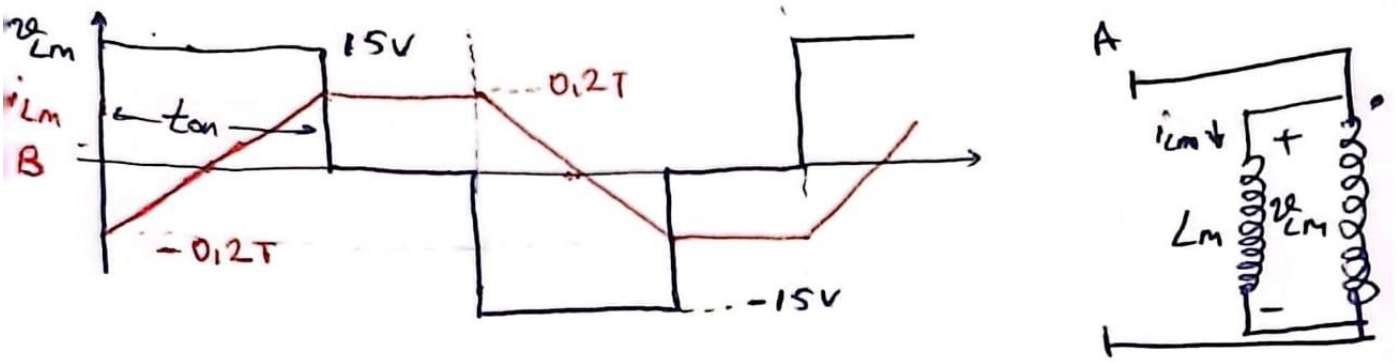
$\frac{3,3}{61,8} = 0,05$ rahat sığar.

Tam Köprü – Yarım Köprü Trafolu Sürme (1)





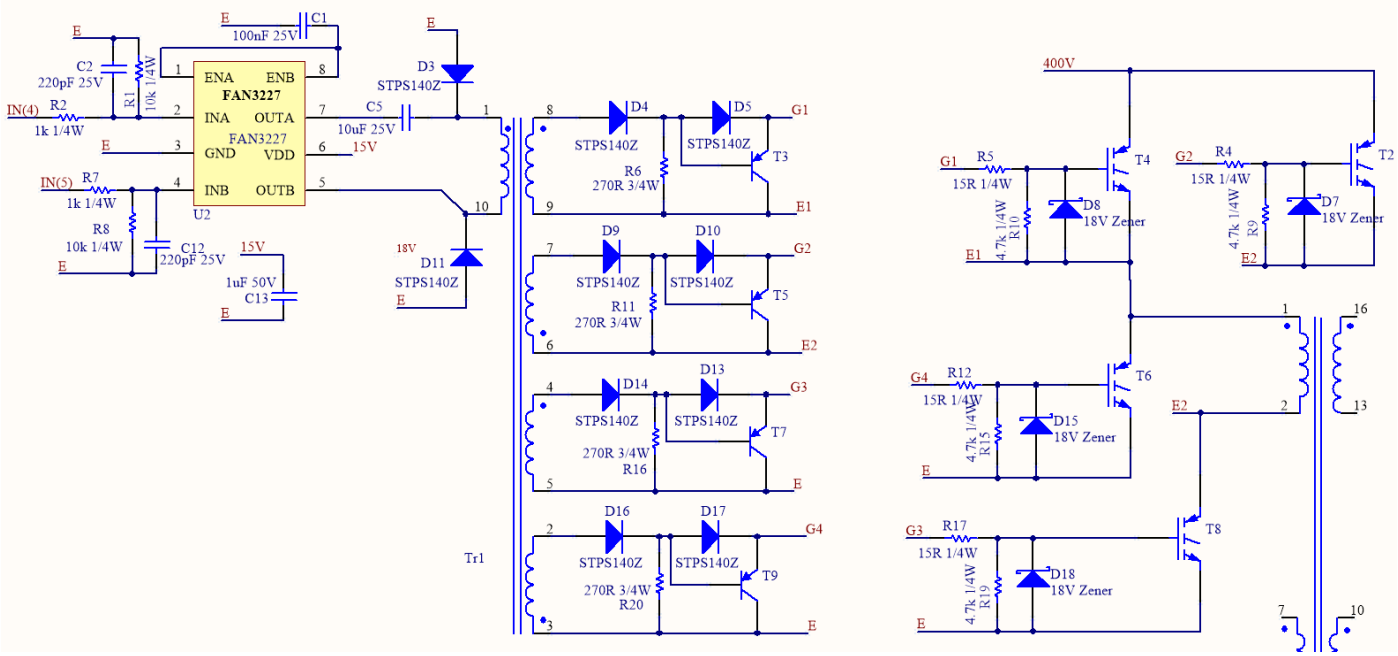
Yarım Köprü – Tam Köprü Dönüştürücü Sürme Trafosu



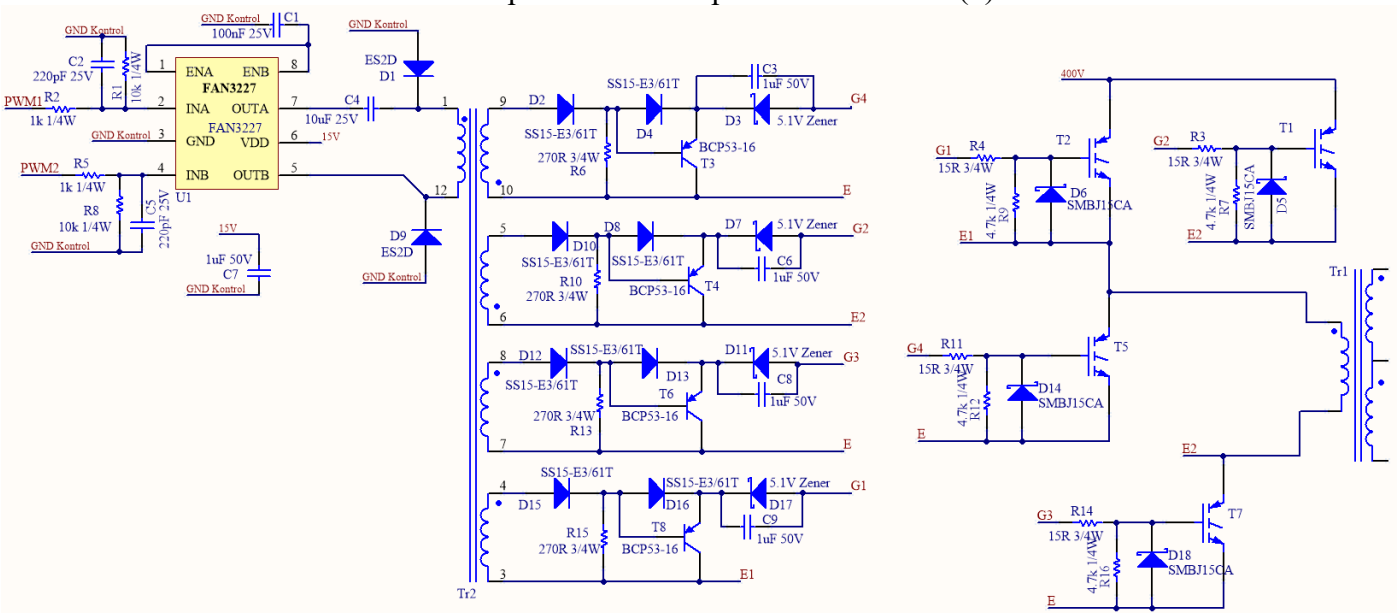
$f = 100kHz \quad t_{on(max)} = 5\mu s$

$N \cdot \Delta B \cdot Ae = V \cdot t_{on} \Rightarrow N \cdot 0,4T \cdot Ae = 15 \cdot 5\mu s \Rightarrow N$ bulunur

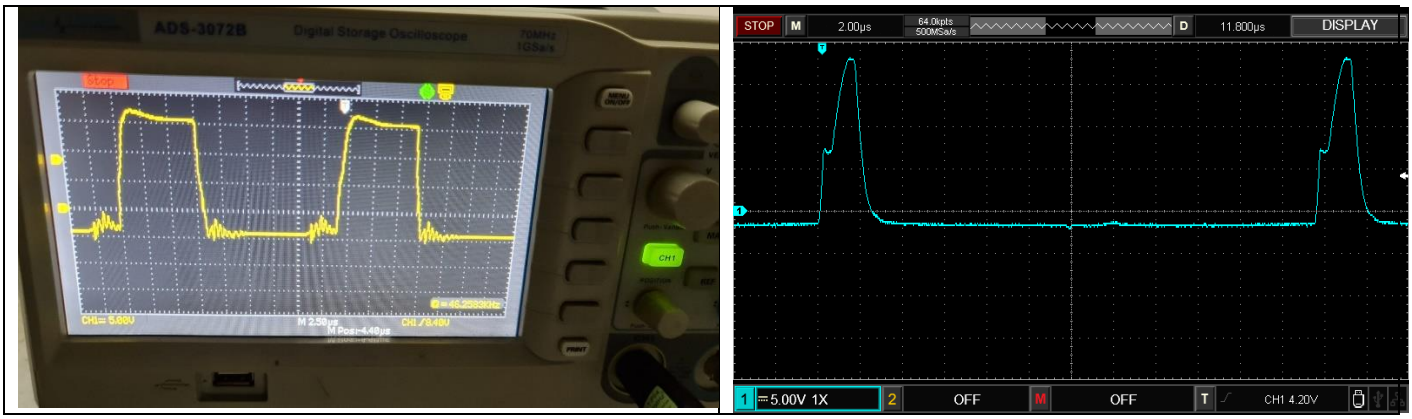
Tam Köprü – Yarım Köprü Trafolu Sürme (2)



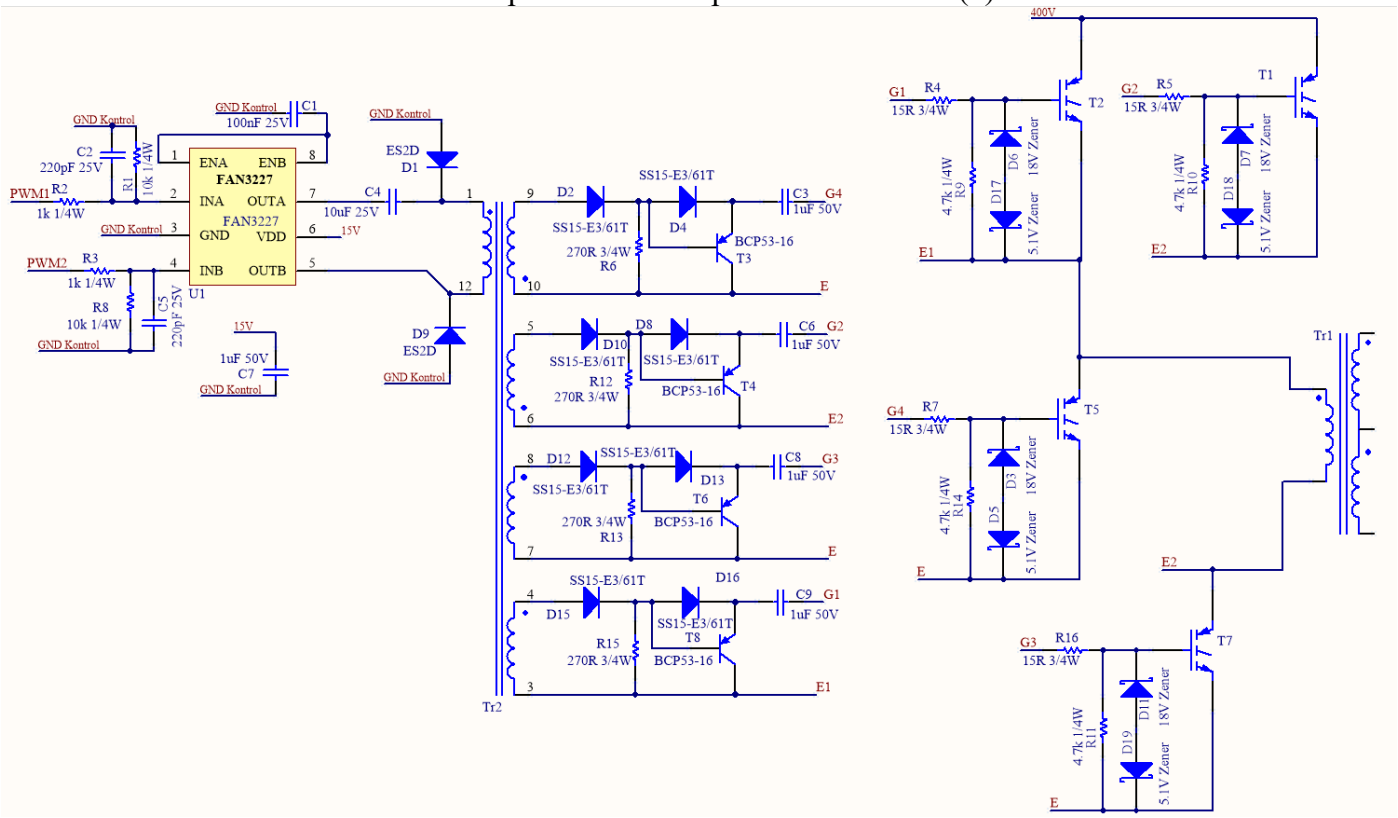
Tam Köprü – Yarım Köprü Trafolu Sürme (3)



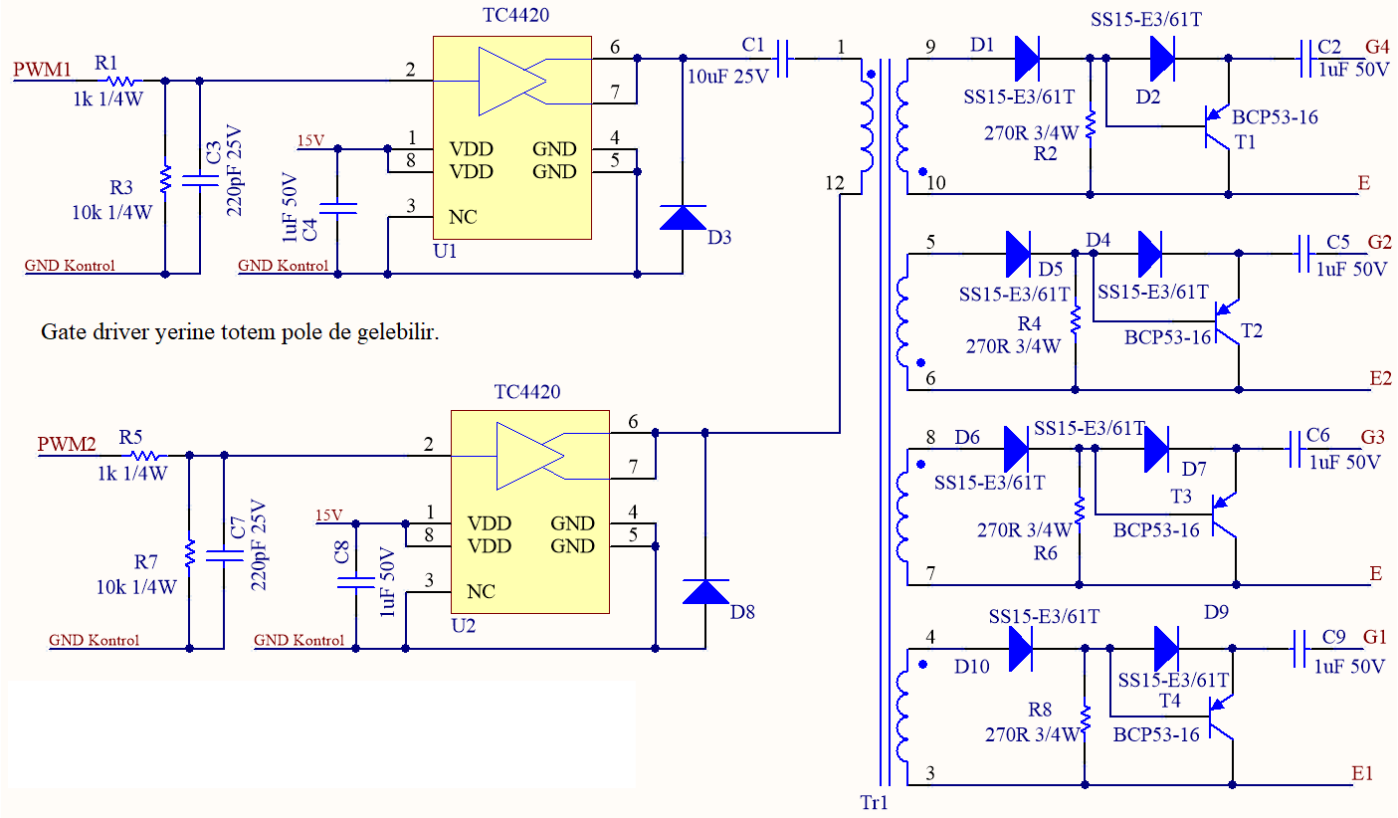
Trafo 1:1.5:1.5



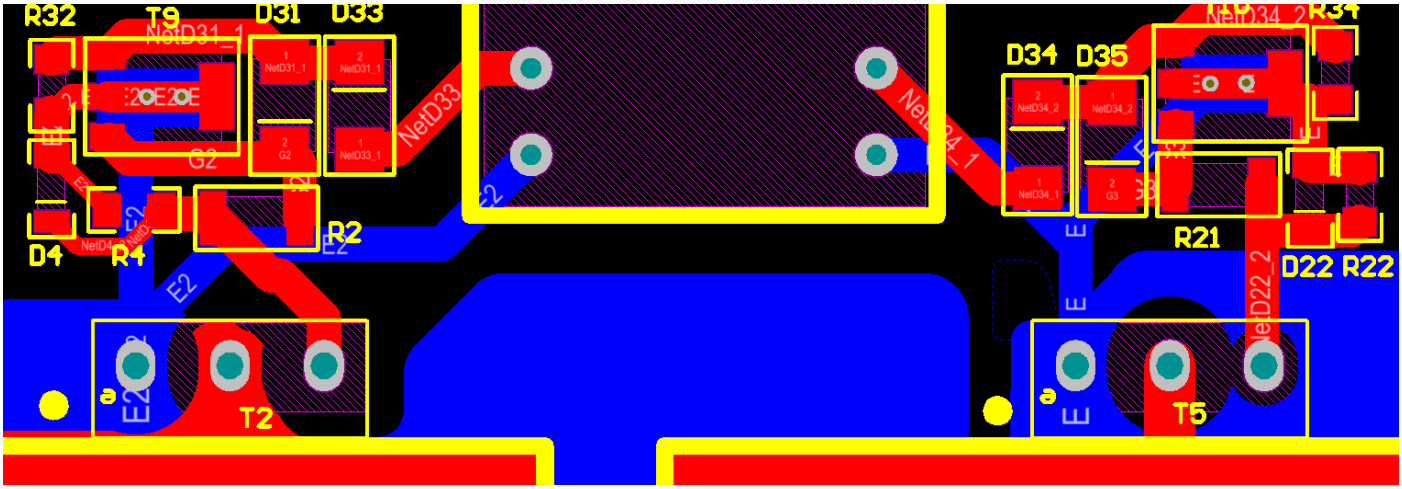
Tam Köprü – Yarım Köprü Trafolu Sürme (4)



Köprü – Yarım Köprü Trafolu Sürme (5)

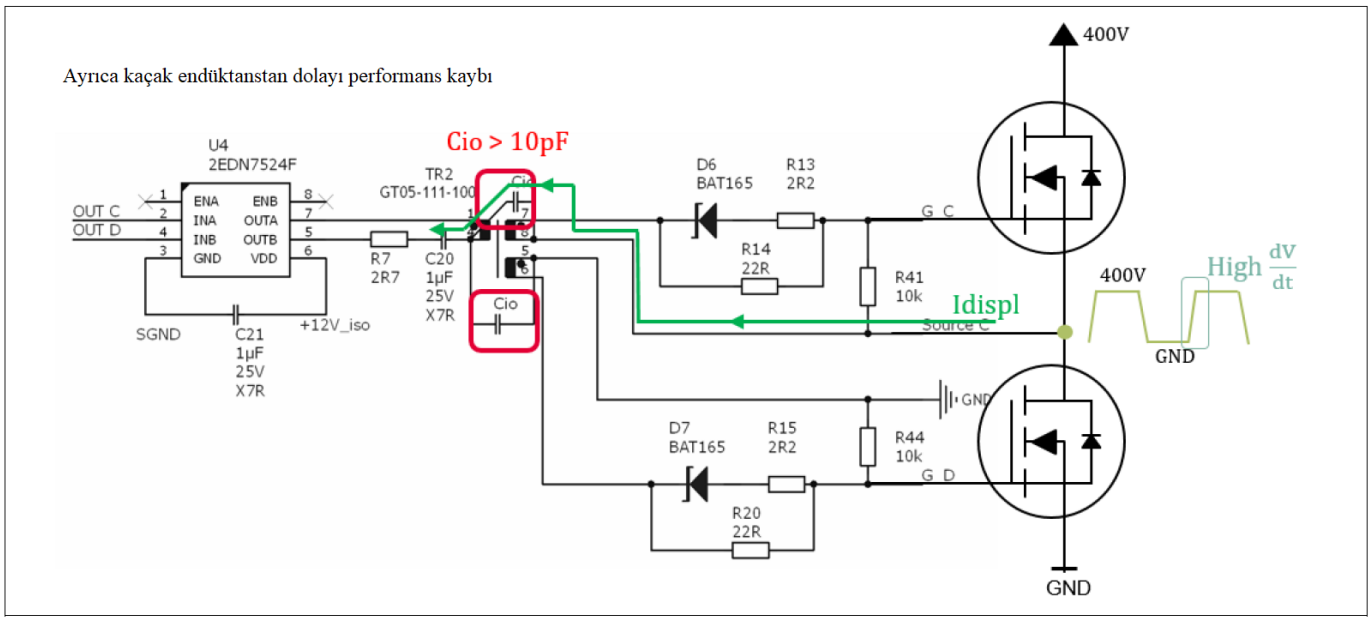


Trafolu sürmenin avantajları
İzolasyon sağlar.
Maliyeti düşük.
PCB çizimi açısından uygulanması kolay
İzoleli gerilim kaynağına ihtiyaç duymaz.

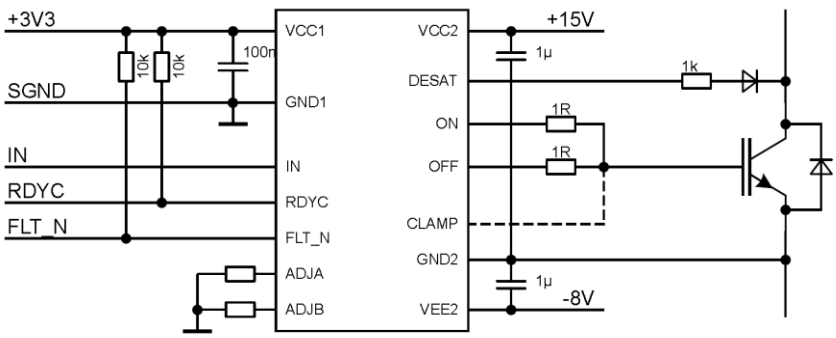


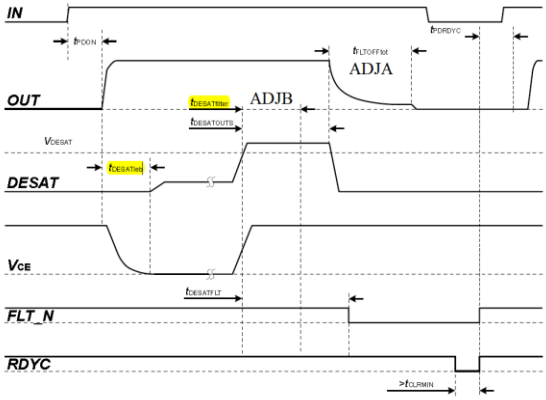
Dezavantajları
DeSat koruma yok.
Active miller clamp yok.
Düşük doluluk oranlarında negatif gerilimde tutma kabiliyeti düşer.
Trafo kaçağı gate şarjını yavaşlatır.
Trafo primer-sekonder parazitik kondansatöründen dolayı yüksek dv/dt'li uygulamalarda (SiC gibi) gürültü problemi oluşabilir. (Common mode transient immunity düşük)

CMTI of this solution. According to [15], the CMTI capability of the pulse transformers is limited to about 50 V/ns. Therefore, the use of pulse transformers is limited to applications with relatively slow voltage transients.



SiC Örnek Bir Sürücü 1ED3461MU12MXUMA1



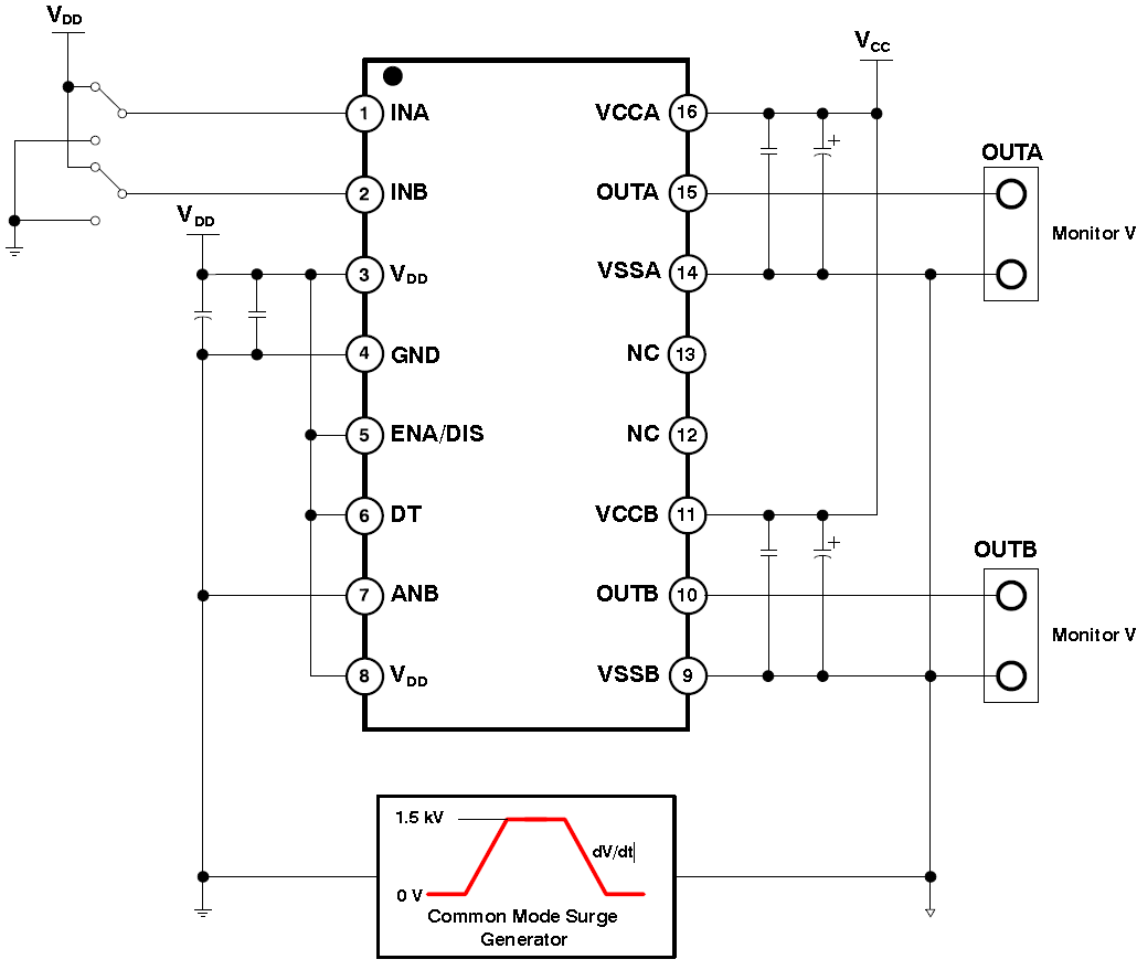


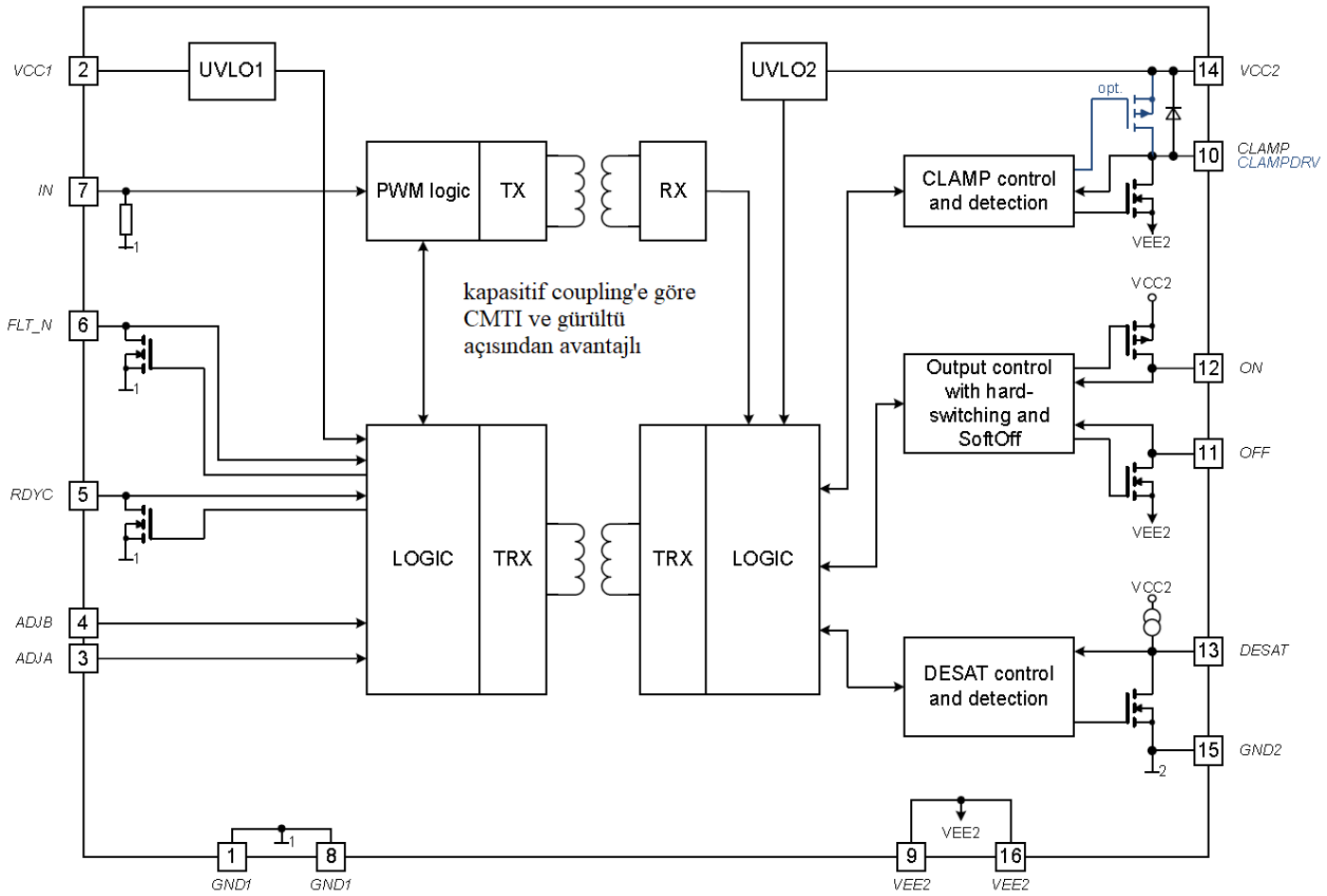
Undervoltage lockout protection with hysteresis for input and output side with activ

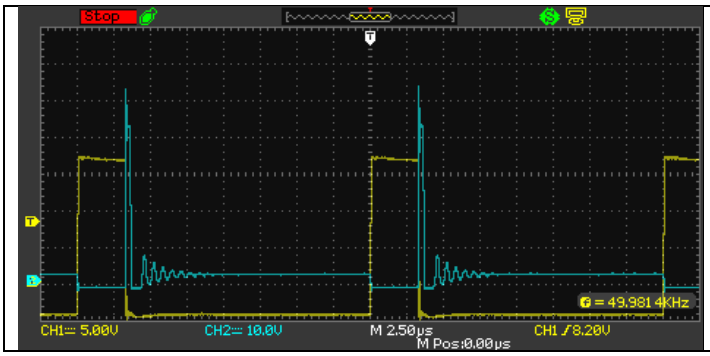
High common-mode transient immunity CMTI = 200 kV/µs

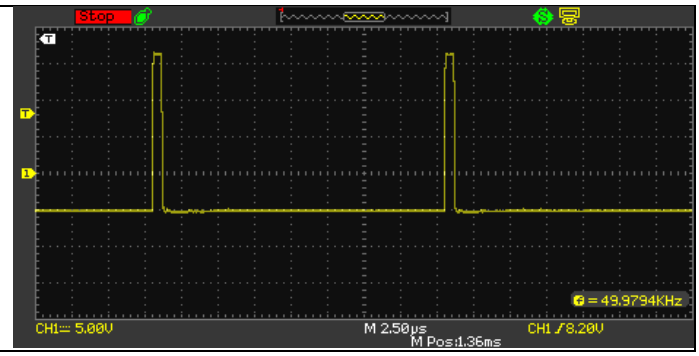
Small space-saving DSO-16 fine-pitch package with large creepage distance (>8 mm)

COMMON MODE TRANSIENT IMMUNITY

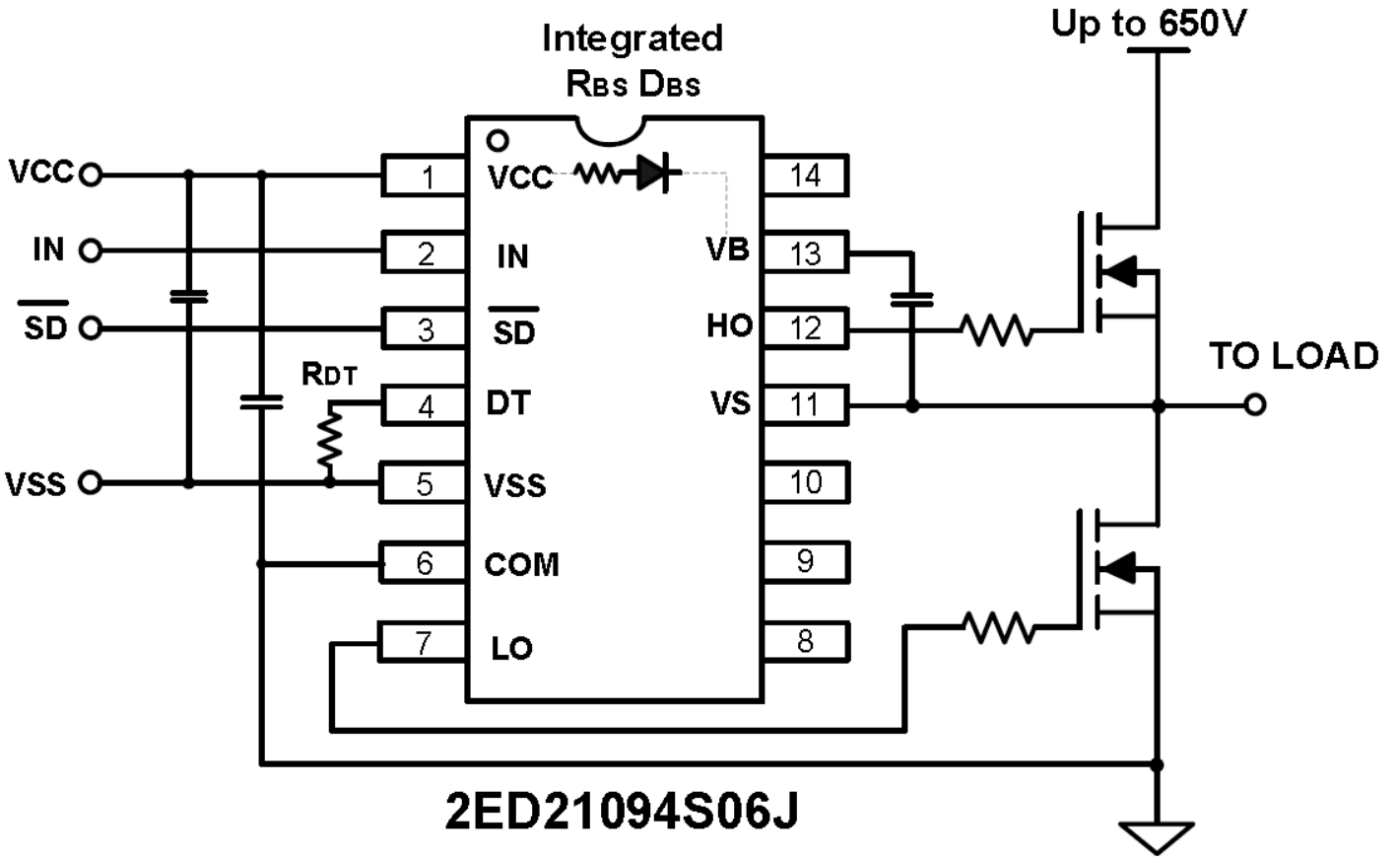


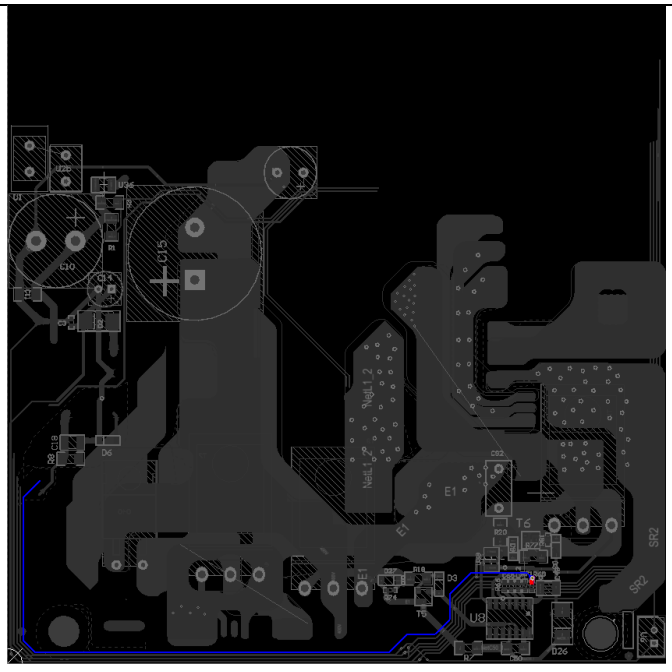
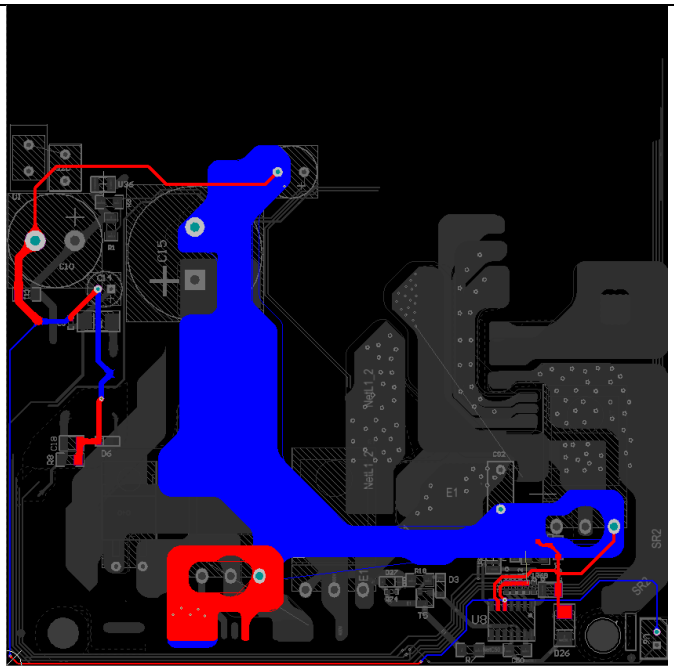

VCC1
2
UVLO1
IN
7
PWM logic
TX
RX
FLT_N
6
RDYC
5
LOGIC
TRX
TRX
LOGIC
ADJB
4
ADJA
3
UVLO2
14
VCC2
opt.
10
CLAMP
CLAMPDRV
CLAMP control and detection
VEE2
VCC2
Output control with hard-switching and SoftOff
12
ON
11
OFF
VEE2
VCC2
DESAT control and detection
13
DESAT
15
GND2
kapasitif coupling'e göre CMTI ve gürültü açısından avantajlı
1
8
GND1
GND1
VEE2
9
16
VEE2
VEE2

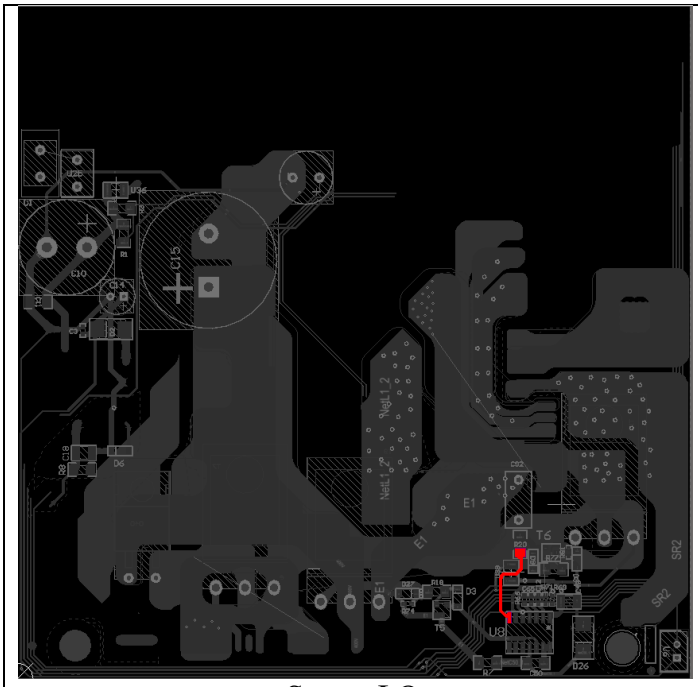

Stop
CH1 5.00V
CH2 10.0V
M 2.50µs
M Pos:0.00µs
CH1 8.20V
49.981.4KHz


Stop
CH1 5.00V
M 2.50µs
M Pos:1.36ms
CH1 8.20V
49.9794KHz

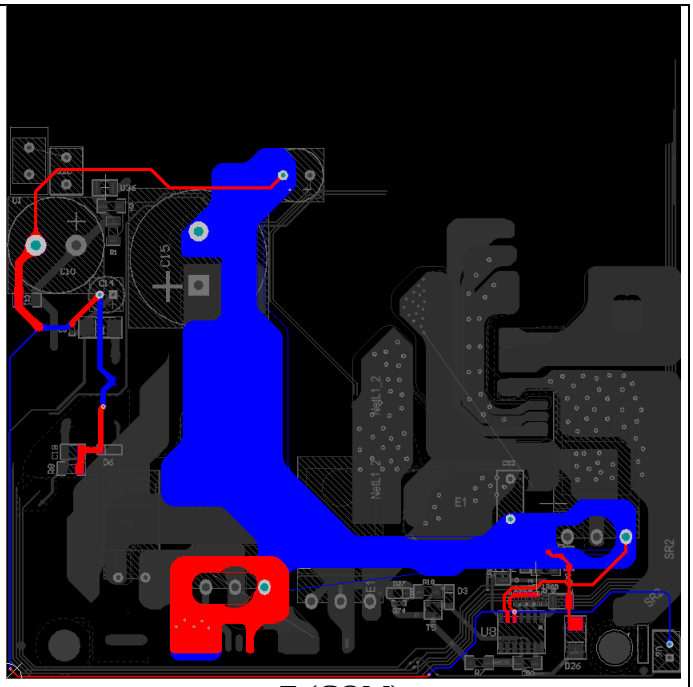
BOOTSTRAP



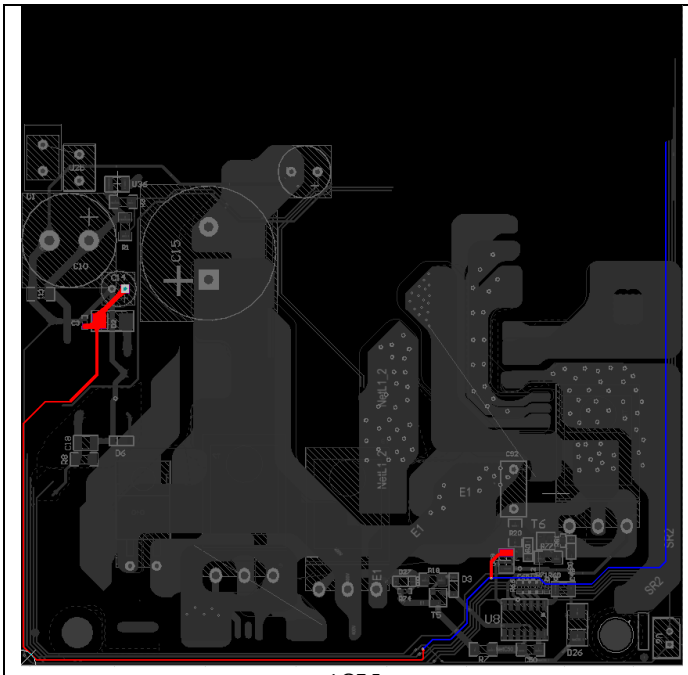
	
IN	E



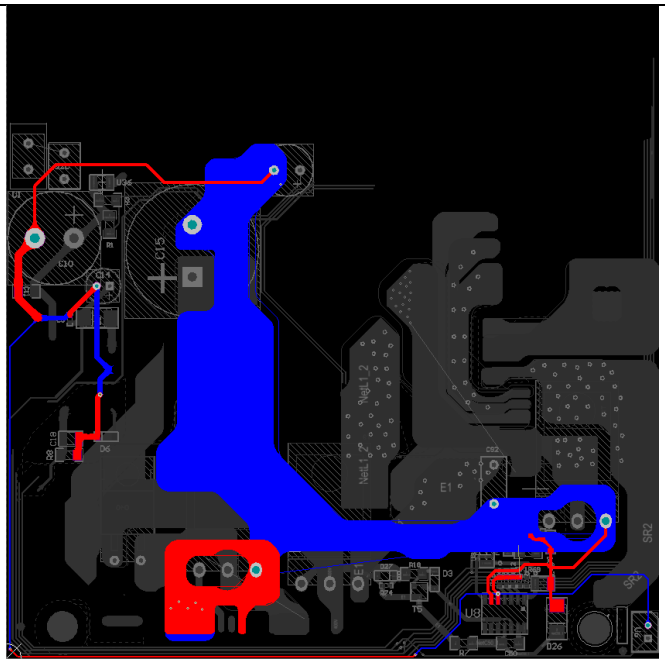
Sürme LO



E (COM)



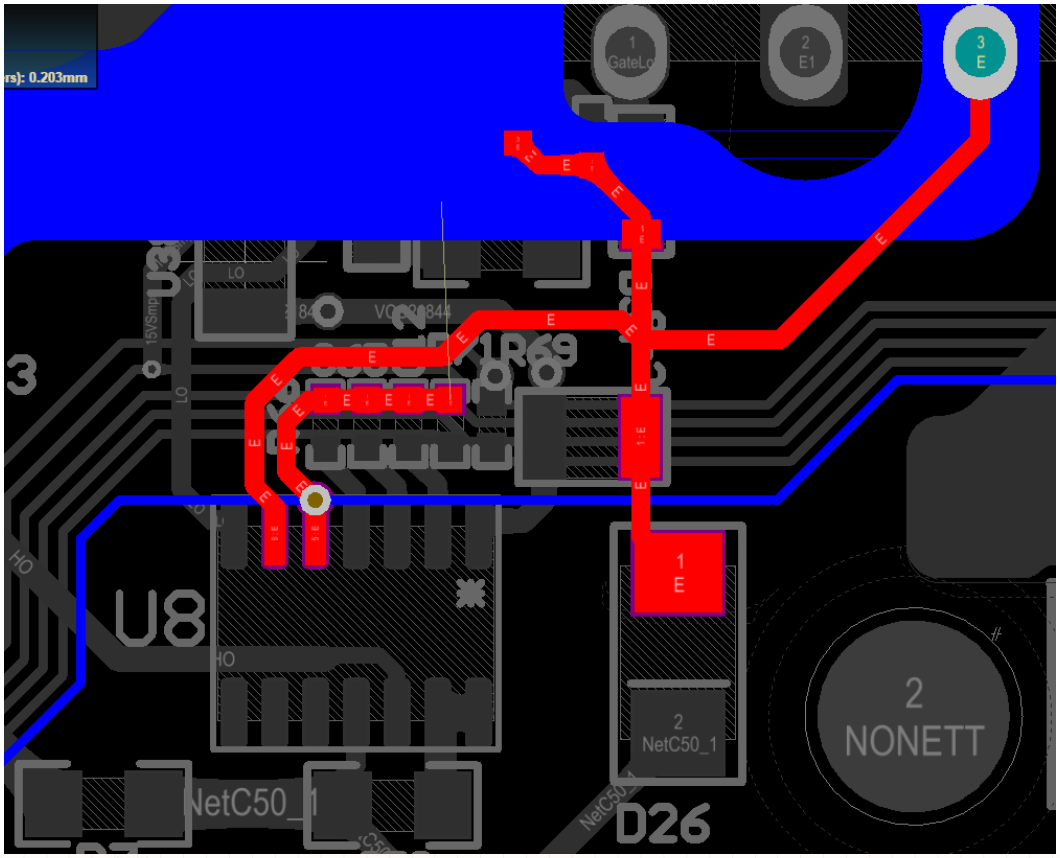
18V

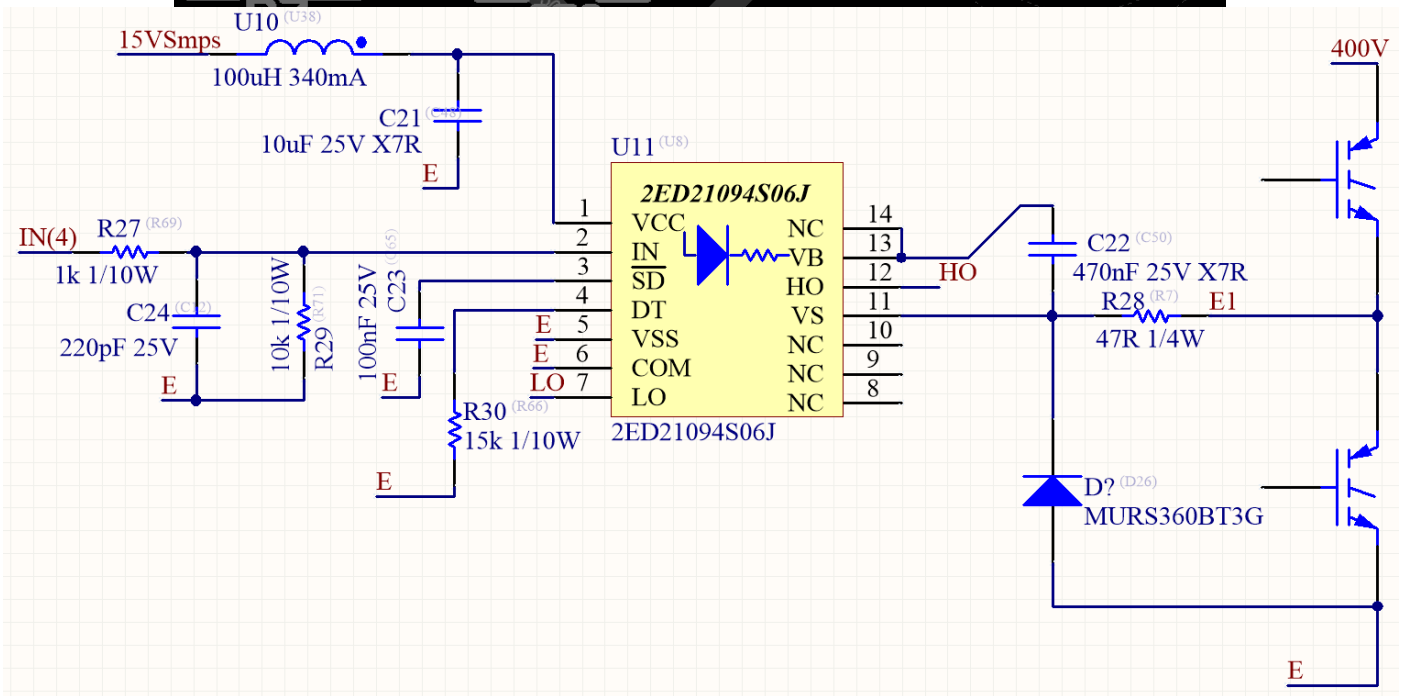


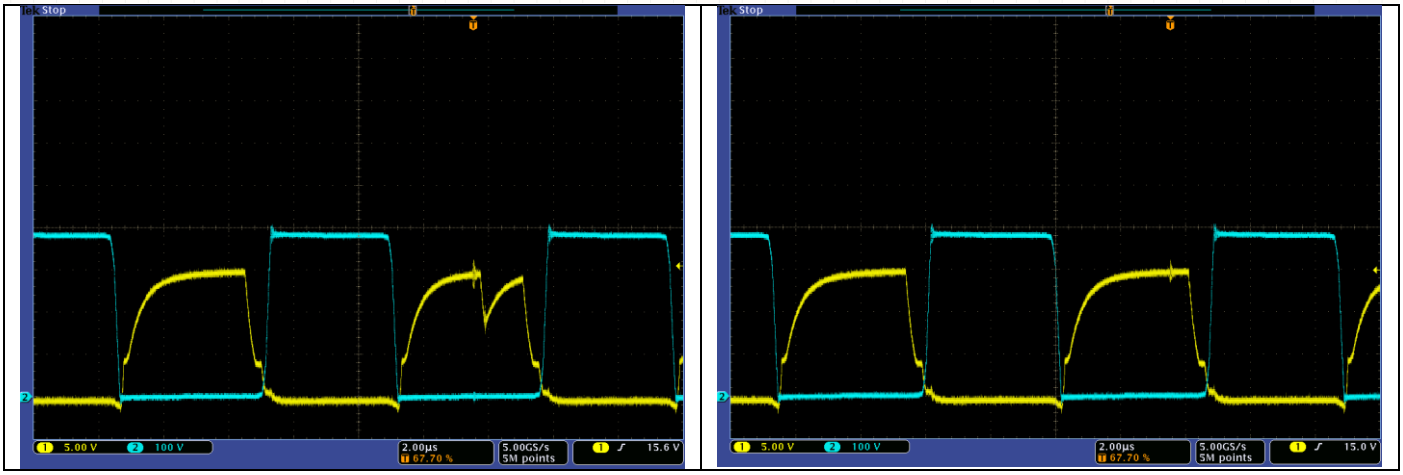
E (COM)

5.10 Tolerant to negative tranisents on input pins

Typically the driver's ground pin is connected close to the source pin of the MOSFET or IGBT. The microcontroller which sends the IN and /SD PWM signals refers to the same ground and in most cases there will be an offset voltage between the microcontroller ground pin and driver ground because of ground bounce. The 2ED210x family can handle negative voltage spikes up to 5 V. The recommended operating level is at negative 4 V with absolute maximum of negative 5 V. Standard half bridge or high-side/low-side gate drivers only allow negative voltage levels down to -0.3 V. The 2ED210x family has much better noise immunity capability on the input pins.


U8
D26
NetC50_1
NONETT
R69


U10 (U38)
15VSmps
100uH 340mA
C21 (C48)
10uF 25V X7R
E
U11 (U8)
2ED21094S06J
VCC
IN
SD
DT
VSS
COM
LO
NC
VB
HO
VS
NC
NC
NC
1
2
3
4
5
6
7
14
13
12
11
10
9
8
IN(4)
R27 (R69)
1k 1/10W
C24 (C52)
220pF 25V
E
10k 1/10W
R29 (R71)
100nF 25V
C23 (C65)
E
E
LO
R30 (R66)
15k 1/10W
E
HO
C22 (C50)
470nF 25V X7R
R28 (R7)
47R 1/4W
E1
400V
D? (D26)
MURS360BT3G
E


Stop
5.00 V
100 V
2.00µs
67.70 %
5.00GS/s
5M points
15.6 V
Stop
5.00 V
100 V
2.00µs
67.70 %
5.00GS/s
5M points
15.0 V