EEEN313 lab 2 300493343   hau shian

1.

Inductor = 0.0038H
Capacitor = 171nF

2.

Cut off frequency = 4.4kHz

3.

<table>
<tr><th>Part</th><th>Input logic</th><th>Cross-conduction prevention logic</th><th>Dead-Time</th><th>Ground Pins</th><th>Ton/Toff</th></tr>
<tr><td>2181</td><td rowspan="2">HIN/LIN</td><td rowspan="2">no</td><td rowspan="2">none</td><td>COM</td><td rowspan="2">180/220 ns</td></tr>
<tr><td>21814</td><td>VSS/COM</td></tr>
<tr><td>2183</td><td rowspan="2">HIN/$\overline{LIN}$</td><td rowspan="2">yes</td><td>Internal 500ns</td><td>COM</td><td rowspan="2">180/220 ns</td></tr>
<tr><td>21834</td><td>Program 0.4 ~ 5 us</td><td>VSS/COM</td></tr>
<tr><td>2184</td><td rowspan="2">IN/$\overline{SD}$</td><td rowspan="2">yes</td><td>Internal 500ns</td><td>COM</td><td rowspan="2">680/270 ns</td></tr>
<tr><td>21844</td><td>Program 0.4 ~ 5 us</td><td>VSS/COM</td></tr>
</table>

0.5uS

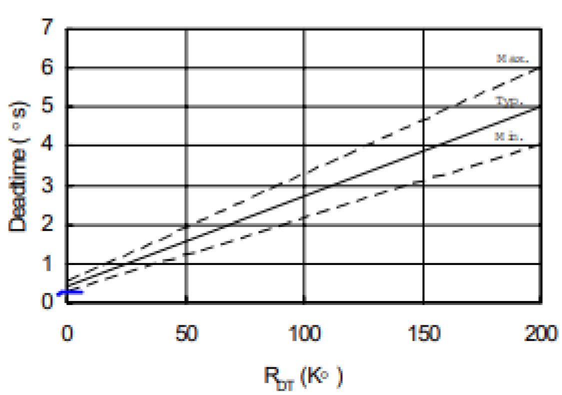

Figure 8C. Deadtime vs. R_{DT}

5kohm estimated

4.

Dead time is the delay between the transistors in series in order to not cause a short to ground. This delay is caused by a resistor of an estimated 5k ohm from the 500nS dead time.

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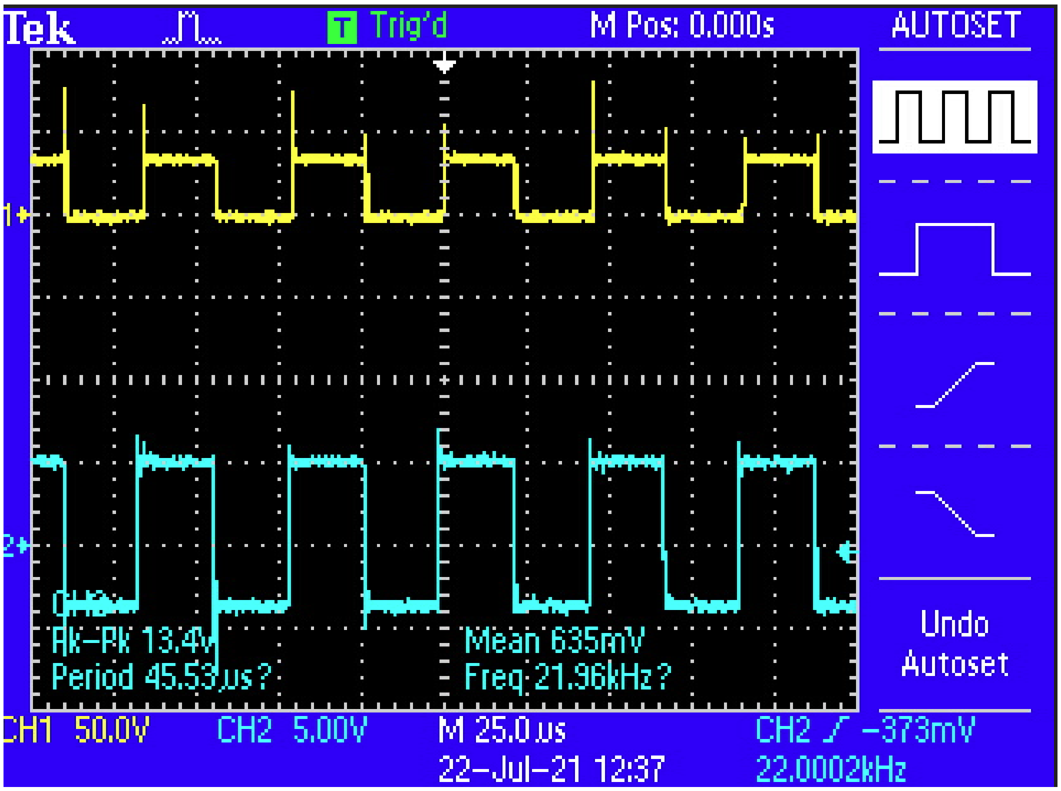
5.

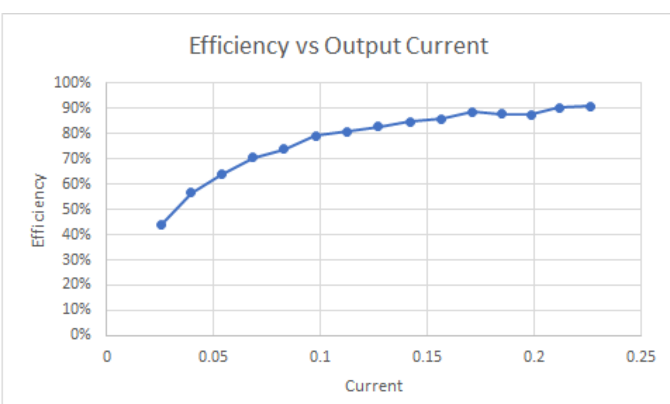
We could use an integrator that smooths the signal out at the output to mitigate the varying input voltage.

6.



Even though the oscilloscope gives a reading of 250ns, if the position was altered in the way that centres the dead time it would provide a reading of 500s. The mosfets created a step down from 30V (yellow reads 50V but we believe it's just due to the spike) to 14V (blue).

7.

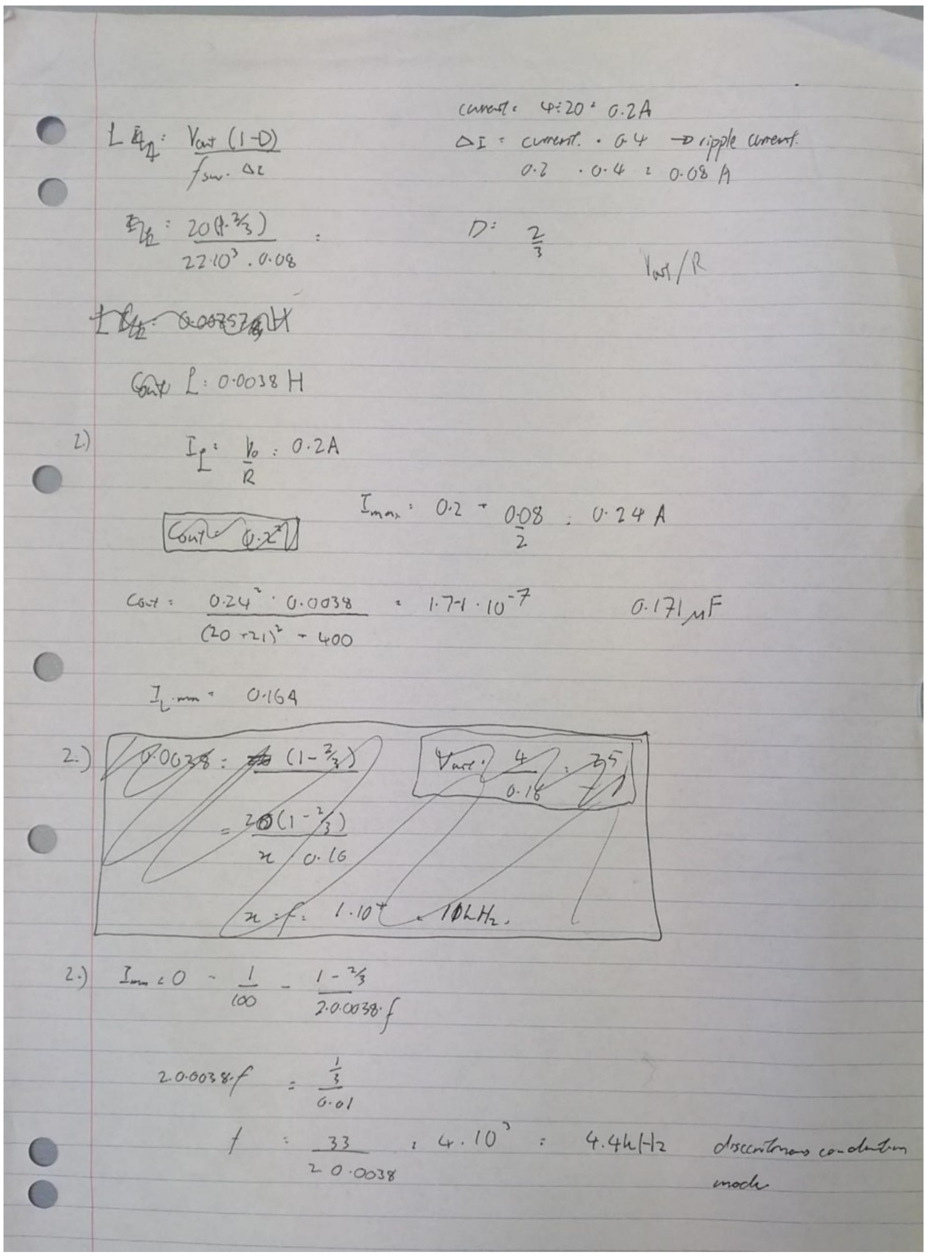


Main losses happen around 0.05A. It reaches steady-state at around 0.25A.

8.

The function of a bootstrap circuit is to alter the input impedance of a circuit. In most cases it uses positive feedback in 2 stages like the grounded transistor of this lab.

Appendix



current = 4 ÷ 20 = 0.2A

ΔI = current · 0.4 → ripple current.

0.2 · 0.4 = 0.08 A

$L = \frac{V_{out}(1-D)}{f_{sw} \cdot \Delta I}$

$= \frac{20(1-2/3)}{22 \cdot 10^3 \cdot 0.08}$ =

D = $\frac{2}{3}$

Vout/R

Cout L = 0.0038 H

2.) $I_L = \frac{V_o}{R} = 0.2A$

$I_{max} = 0.2 + \frac{0.08}{2} = 0.24\ A$

$C_{out} = \frac{0.24^2 \cdot 0.0038}{(20+21)^2 - 400} = 1.71 \cdot 10^{-7}$ 0.171 μF

$I_{L\,min}$ = 0.164

2.) $I_{min} = 0 = \frac{1}{100} - \frac{1-2/3}{2 \cdot 0.0038 \cdot f}$

$2 \cdot 0.0038 \cdot f = \frac{1/3}{0.01}$

$f = \frac{33}{2 \cdot 0.0038} = 4 \cdot 10^3 = 4.4 kHz$ discontinuous conduction mode

For question 2; the duty cycle was calculated as vout/vin