

**1a**

Output voltage 30V

**1b**

Switching frequency 46kHz 93kHz

**1c**

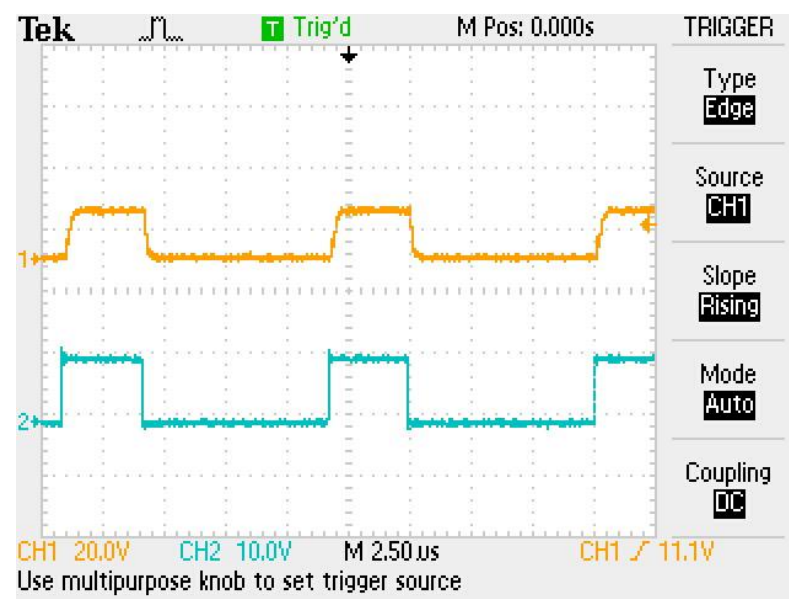
Output current 0.06A

**1d**

Inductor current ripple 0.018A to 0.036A

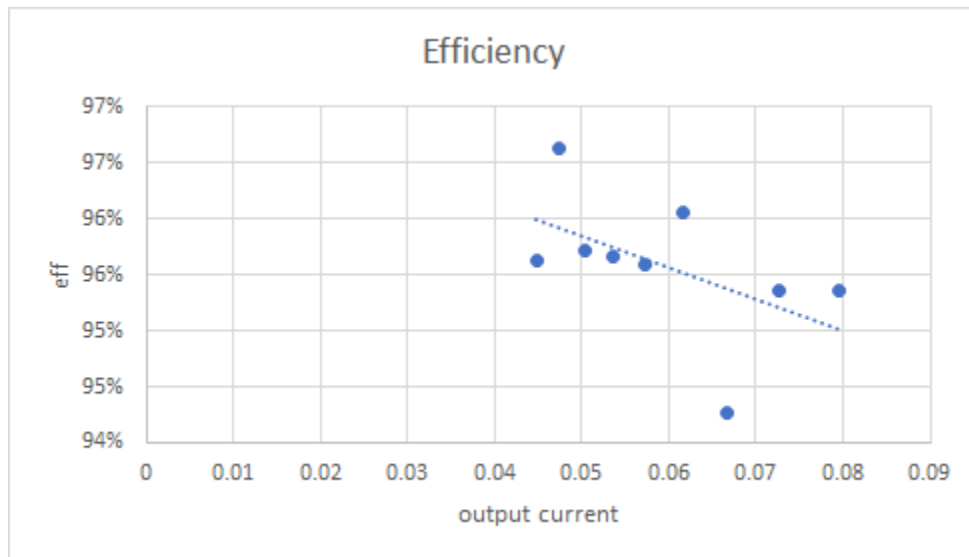
**1e**

V ripple = 0.00237V

**2**

Orange is the output of the mosfet (Gate), bottom is the input PWM. (At 30% duty cycle); some dead time due to the mosfet

3



Graph indicates that between the output frequency of 0.04 and 0.08; median efficiency lies between 96% and 95%

## Appendix

1a

Output voltage:  $(1/(1-0.33)) * 20 = 30$

1b

$$L = \frac{V_{in}(V_{out} - V_{in})}{f_{sw}\Delta I_L V_{out}}$$

$$4 * 10^{-3} = 4 * 10^{-3} = \frac{20(30-20)}{f * (0.018 \text{ to } 0.036) * 30} \therefore f = 92592.593 \text{ Hz to } 46296.2963 \text{ Hz}$$

1c

$$I_o = V_o/R \therefore 30/500 = 0.06 \text{ A}$$

1d

$$\Delta I_L = 0.2 \text{ to } 0.4 \times I_{out} \frac{V_{out}}{V_{in}}$$

$$0.2 * 0.06 * 1.5 = 0.018 \text{ to } 0.036\text{A}$$

**1e**

$$C_{out} = \frac{I_{out(max)} D}{f_{sw} \Delta V_{out}}$$

$$90 * 10^{-6} = (0.06 * 0.3) / (93\text{kHz} * V) \therefore V = 0.00237\text{V ripple current: } 0.00000474\text{A}$$