Beregning av Boost converter

OnSemi MC34063A datasheet side 11

$V_{SAT} = 0{,}45\,V$ (datasheet side 16)

$V_F = 0{,}47\,V$ 1N5819 datasheet

$V_{in} = 3{,}75\,V \pm 20\%$ (3stk AA batteri, halvfulle)

$V_{out} = 6{,}25\,V$ For å drive 150mA i 8Ω høytaler

$I_{out} = 150\,mA$ (antatt forbruk for høytaler)

$f_{min} = 100\,kHz$ (høy frekvens ⇒ liten spole)

$V_{ripple(pp)} = 100\,mV$

SMPS utregninger

$$t_{on}/t_{off} = \frac{V_{out} + V_F - V_{in(min)}}{V_{in(min)} - V_{sat}} = \frac{6{,}25 + 0{,}47 - 3}{3 - 0{,}45} = 1{,}46$$

$$t_{on} + t_{off} = \frac{1}{f} = \frac{1}{100k} = 10\mu s$$

$$t_{off} = \frac{t_{on} + t_{off}}{(t_{on}/t_{off}) + 1} = \frac{10\mu s}{1{,}46 + 1} = 4{,}07\mu s$$

$$t_{on} = (t_{on} + t_{off}) - t_{off} = 10\mu s - 4{,}07\mu s = 5{,}93\mu s$$

$$C_T = 4{,}0 \cdot 10^{-5} \cdot t_{on} = 4 \cdot 10^{-5} \cdot 5{,}93\mu s = 237pF$$

$$I_{pk} = 2 \cdot I_{out(max)} (t_{on}/t_{off} + 1) = 2 \cdot 0{,}25 \cdot 2{,}46 = 1{,}23A$$

$$R_{sc} = 0{,}3 / I_{pk(switch)} = 0{,}3 / 1{,}23A = 244m\Omega$$

$$L_{(min)} = \left(\frac{V_{in(min)} - V_{sat}}{I_{pk(switch)}}\right) t_{on(max)} = \frac{3 - 0{,}45}{1{,}23} \cdot 5{,}93\mu s = 12{,}3\mu H$$

$$C_o = 9\frac{I_{out} \cdot t_{on}}{V_{ripple(pp)}} = 9\frac{0{,}15 \cdot 5{,}93\mu s}{100mV} = 80\mu F$$

NE555 output

@ 150mA

$V_{OH} = 6{,}25 - 1{,}75 = 4{,}5V$

$V_{OL} = 2{,}1V$

$\Big\} \; 2{,}4V \Rightarrow \pm 1{,}2V$