Jrule Motor

Current @ 3.3 V

Op Amp: ≈ 300 mA

Transceiver: ~0.5mA (max)

Hall Sens: 2.4 mA (max)

ADC: 300 μA

Current @ 5V

Motor - FF45RE: 500 mA (max)

Max Current input at ~600mA with a

comfortable buffer.

Buck Converter Passives

Recommended Value

$R_{FBT} = 100\ k\Omega$

$V_{out} = 5V$

$V_{REF} = 1$

$$R_{FBB} = \frac{R_{FBT}}{\left[\frac{V_{out}}{V_{REF}} - 1\right]}$$

$$R_{FBB} = \frac{100{,}000}{\left[\frac{5}{1} - 1\right]}$$

$R_{FBB} = 25{,}000\ \Omega$

Inductor Selection

30% of max current output

$k = 0.3 I_{out\,Max}$

$k = 0.3(0.6A)$

$k = 0.18$

$$L = \frac{(V_{in} - V_{out})}{f_{sw}\, k\, I_{out\,max}} \cdot \frac{V_{out}}{V_{in}}$$

$V_{in} = 48V$

$V_{out} = 5V$

$I_{out\,Max} = 0.6A$

$f_{sw} = 400\ kHz$

$$L = \frac{(48V - 5V)}{(400{,}000\,Hz)(0.18)(0.6A)} \cdot \frac{5V}{48V}$$

$L = 1.837 \cdot 10^{-4}\ H$

$L = 183.7\ \mu H$

We can pick

$L = 180\ \mu H$ (Standard Capacitor)

Output Capacitor Selection

$$C_{out} \geq \frac{\Delta I_{out}}{f_{sw}\, \Delta V_{out}\, k} \left[(1-D)(1+k)\frac{k^2}{12}(2-D)\right] ??$$

$\Delta V_{out} = 0.25V$

$\Delta I_{out} = 100mA$

$k = 0.18$

$D = 0.96$