

Expected Results with a 14 Pole Motor (Outrunner)

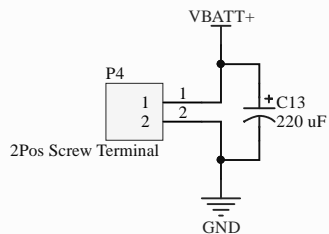
Use recommended ceramic oscillator (fOSC = 4.19 MHz)

FST	FMAX	Starting RPM*	Maximum RPM*
High (Open)	High (Open)	91	23382
High (Open)	Low	91	11691
Low	High (Open)	23	2923
Low	Low	23	1462

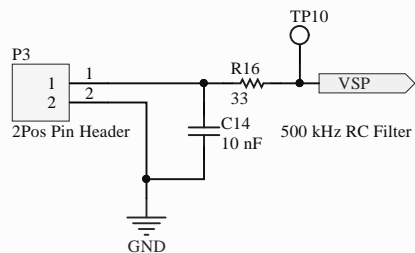
* RPM = (Hz / (poles / 2)) * 60s, sample motor has 14 poles

Title		
Fault-Tolerant Quadcopter		
Size	Number	Revision
A	ESC	A
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Main Power Input



Main Control Input



Start-up and Timing Control

From the datasheet:

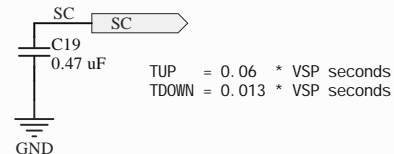
The most appropriate conditions for startup must be determined by doing an experiment by changing C1 C2, R1, Fst and VSP.

Capacitor on SC is C1, controls TUP and TDOWN which are the rise and fall time of the voltage on SC with respect to VSP:

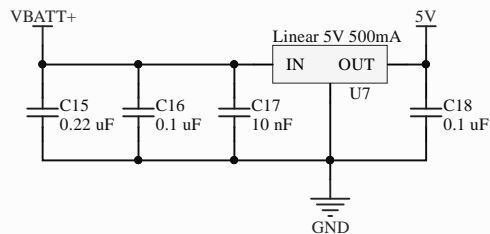
$$\begin{aligned} TUP &= C1 * VSP / 3.8\mu A \\ TDOWN &= C1 * VSP / 36\mu A \end{aligned}$$

This controls the duty cycles for initial DC excitation and forced commutation mode it has to be a static configuration because sensorless feedback isn't reliable yet

Application circuit uses 0.47 uF, we will start with that as well



5V Regulation

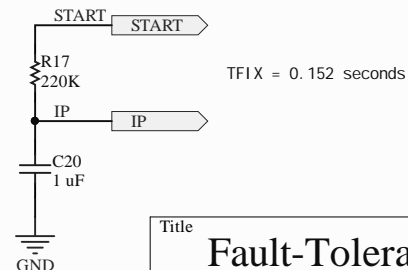


Output PWMs have 20mA drive strength, linear regulation makes sense

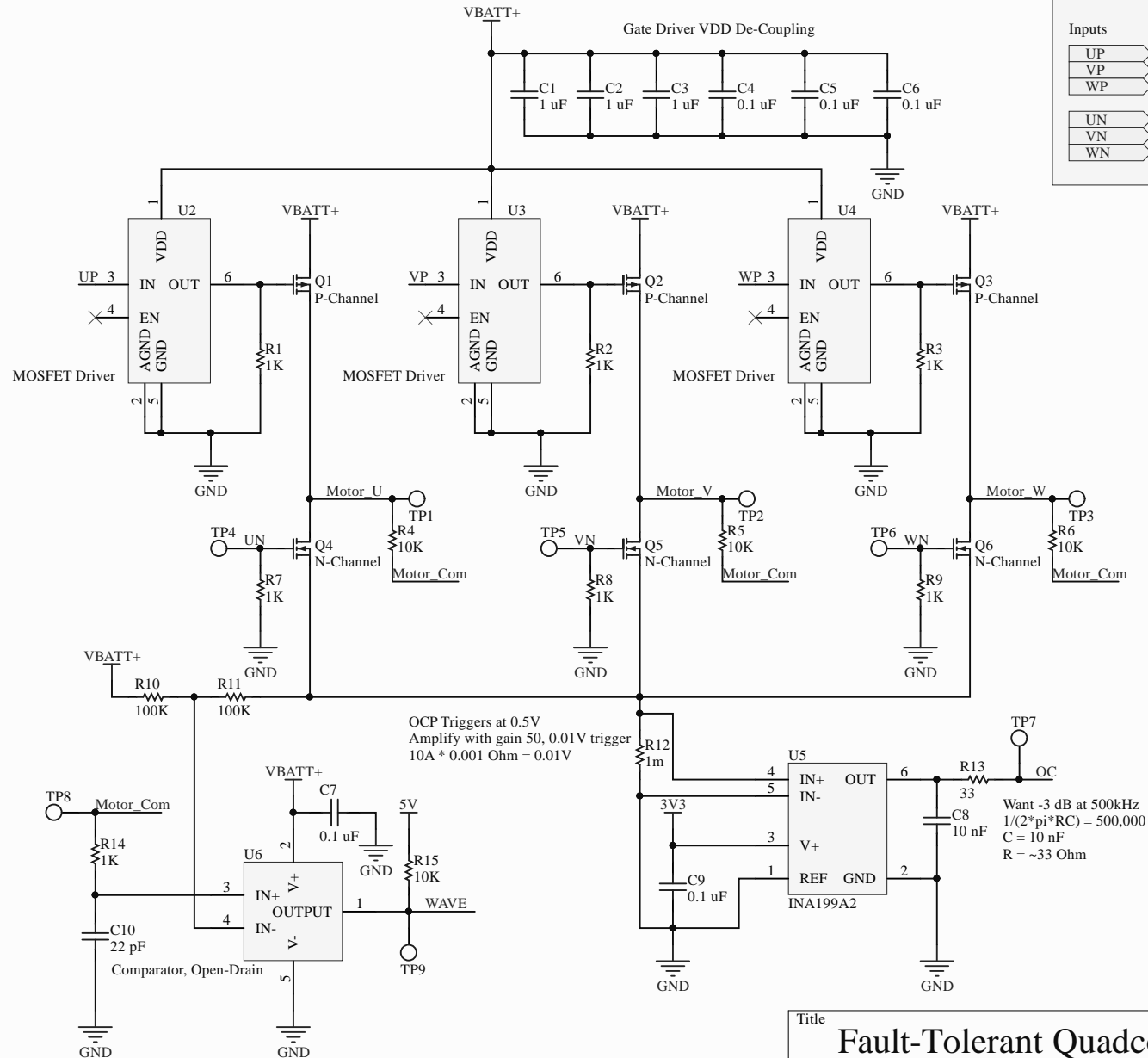
START is an output and IP is an input, when the voltage on IP reaches VDD/2, the DC excitation period is over. A DC excitation puts the rotor in a known position so that the normal BLDC cycles can follow.

$$TFIX = 0.69 * C2 * R1$$

Application circuit uses 220k R1 and 1 uF C2:



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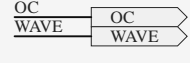


Signal Interface

Inputs



Outputs



Title

Fault-Tolerant Quadcopter

Size

Number

Revision

A

ESC

A

Date: 10/29/2018

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File: C:\Users\...\fets.SchDoc

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