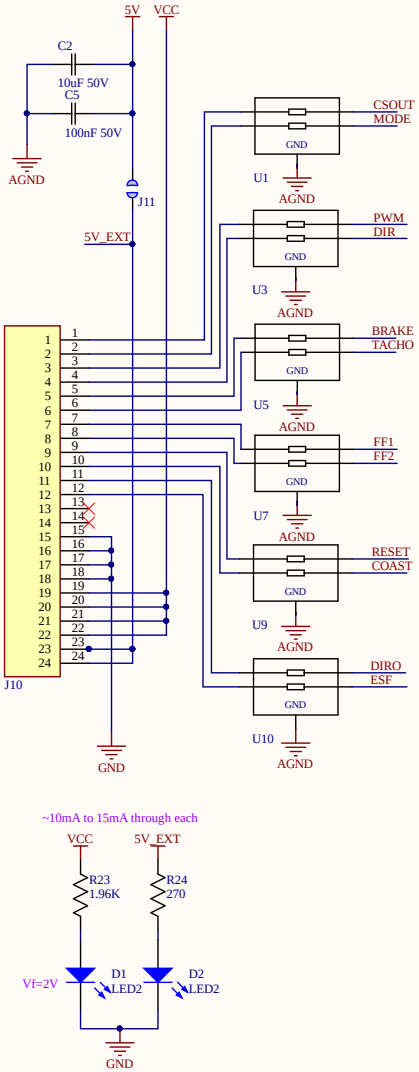
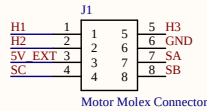
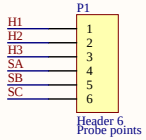
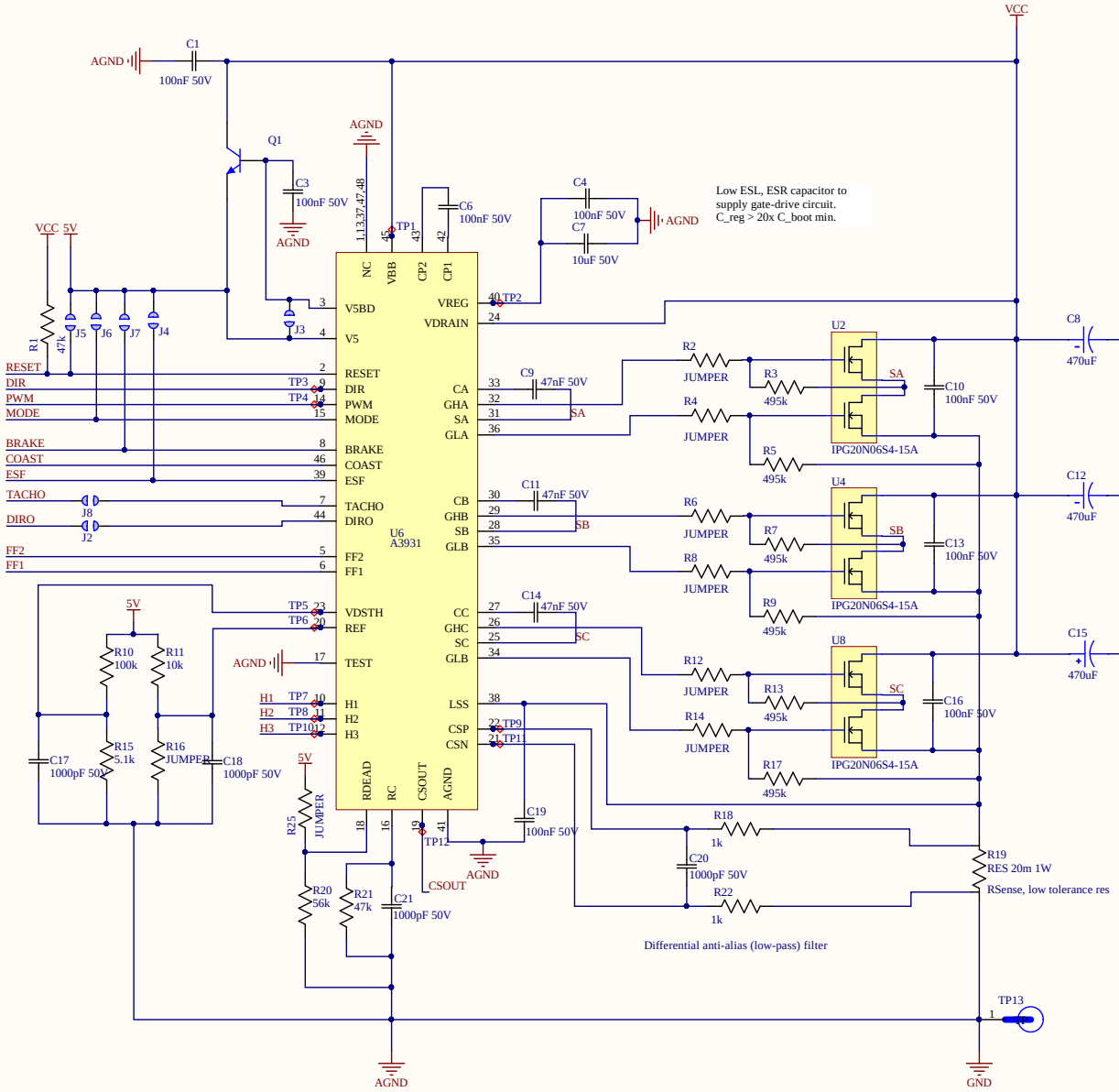
Power + Control Signals



Inverter-Motor Interface







Maxon 251601 nominal current 2.33A,
A3931 internal amplifier gain 19.
The fullscale current sense value
Vfs_CSOUT = 19*2.33*20mOhm 0.9V.

Since motor surge current is 20A+,
investigate the current spike at 0rpm
with max inertial/frictional load
and interaction with driver current limit.
Otherwise starting torque will be low
and ramp speed is limited. See ref pin details.

OLD Bootstrap calc	New BS calc here :)
CBOOT = QGATE*20/VBOOT VBOOT = VDD-VF-VGSMIN VBOOTMIN = 22.2-2.2-0 = 20 CBOOT = 76nC*20/20 = 76nF Closest standard value was 82nF	CBOOT = 47nF

Short Fault VDSTH:
VDSTH - short to VCC/GND comparator reference
Sx - VDrain > VDSTH = short to GND
Sx - LSS > VDSTH = short to VCC
The voltage differential is calculated with Rdson_min for the respective MOSFET.

VDSTH = I_mot_max * (R_sense + Tolerance_+) * SF
= 23.3A * (20mOhm *1.01) * 1.05
0.47V

This value should theoretically be lower.
R_mot = 1Ohm. VCC = 24V nominal.
Shorts (given a 10% derating @ PWM = 1) max out at 20A.
Aside, if I_mot = 20A. RIP another Maxon motor :(

RC PWM Circuit:
Enables external PWM for speed control while enabling the current sense and limiting functions.
The capacitor dictates the blanking time for current sensing (CSP/CSN) during the reverse recovery time, t_pi, of the body diode in the highside FET.

Dead time:
Values pulled from the IPG20N06S4-15A and A3931 datasheet for dead time.
This assumes 10Ohm gate-line. Deadtime should increase with slower slew rates.

t_dead 0.1+33/(5+I_dead) t_d_drive + t_dead_fet = 910ns
I_dead 36uA
R_dead 56kOhm

t_d_drive = t_on_rise + t_on_fall + t_off_prop_delay (hall) 900ns
t_dead_fet = [(t_d_off_max - t_d_on_min)] x Safety Factor 10ns
t_d = switch delay time; t_r, t_f are rise/fall respectively. SF = 1.4

Title		
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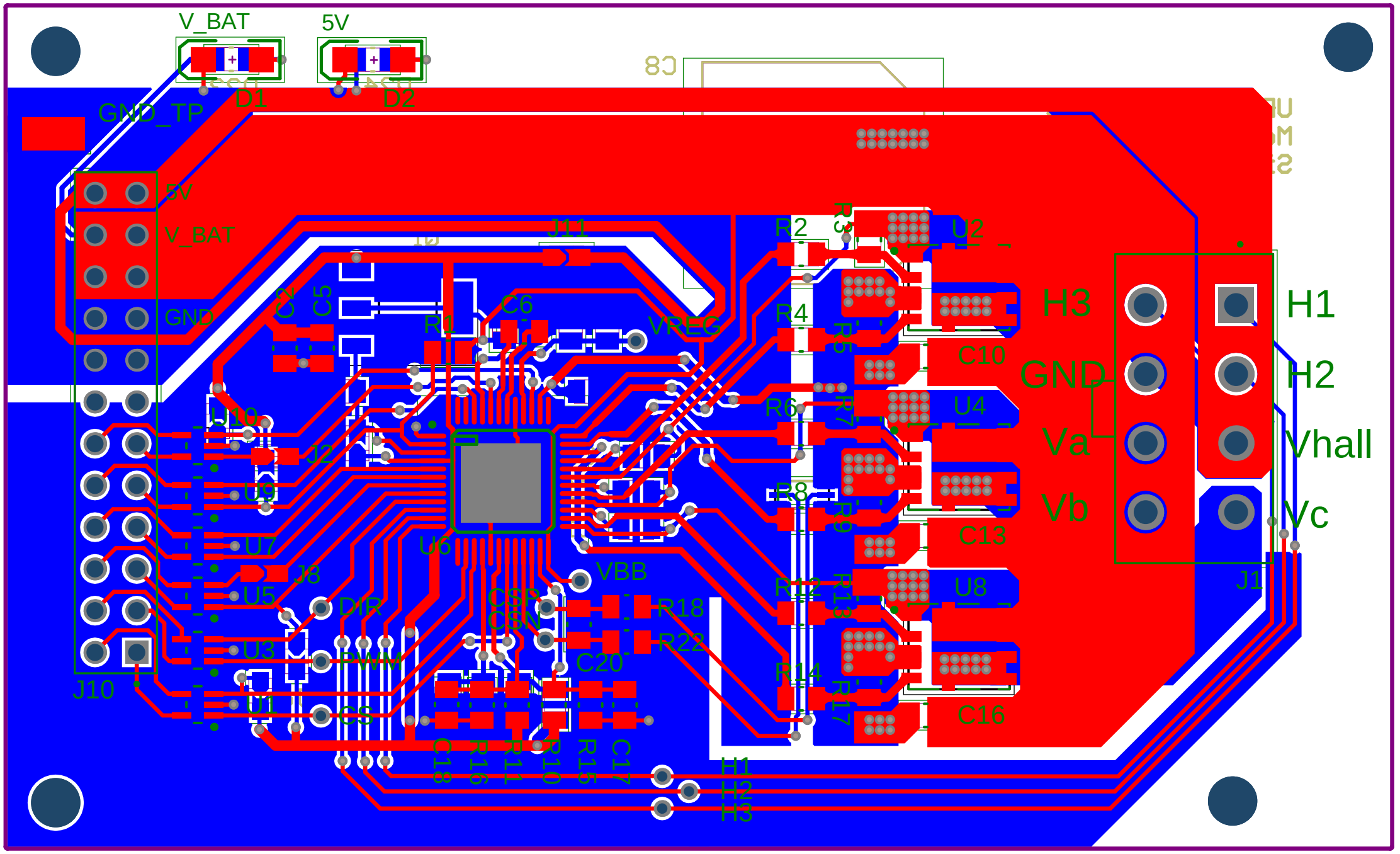
V_BAT
5V
D1
D2
GND_TP
5V
V_BAT
GND
J10
J11
J2
J8
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
R1
R2
R4
R6
R8
R12
R14
R18
R22
C5
C6
C10
C13
C16
C20
VREG
VBB
CSP
CSN
DIR
PWM
CS
H3
GND
Va
Vb
H1
H2
Vhall
Vc
J1