Bootstrap Capacitor
source: https://www.onsemi.com/pub/Collateral/AN-6076.pdf.pdf
delta(Vboot) = Vdd - Vf - Vgsmin
delta(Vboot) = 17V - (0.22~0.45V) - 10V = 6.55~6.78V
(10V for min Rdson)
(CUS08F30,H3F for schottky diode)

Qtotal = Qgate + (Ilkgs+Ilkcap+Iqbs+Ilk+Ilkd)*tON+Qls
Qtotal = (22nC*2) + (100nA+(neglected for ceramic cap)+150uA+50uA+50uA)*25us + 3nC(assumption)
Qtotal = 53.2525nC

Cboot = 53.2525nC/(6.55~6.78V) = 7.854~8.130nF

=> Minimum capacitance is 8130pF
=> Selected 8200pF with 5% tolerance

Gate Resistor
source: http://www.ti.com/lit/an/slla385a/slla385a.pdf?&ts=1590117117714

Q = omega(Ls)/Rg
f = 20kHz => omega = 2pi f = 2pi(20kHz) = 125663.7061 rad/s
source: https://www.allaboutcircuits.com/tools/capacitor-impedance-calculator/

Q = 1 for faster rise time, less damping
1 = (125663.7061 rad/s)(0.65nH)/Rg
Rg = 81.7 uOhms < Internal gate resistance of 1.1 Ohm

=> Gate series resistor not needed

J1 1935161 — D1 20V SMAJ20A-TR — 17V — GND

U1 IRS2186STRPBF — VCC, VB, HIN, HO, VS, LIN, LO, COM
D2 30V BOOTSTRAP_L — C2 8200pF 500V
C4 0.1uF 50V
TP1 HIGH_SIDE_P — DIR_INV

Q1 Q2 NTMFS4935NT1G — HIGH_SIDE_L — R1 0805 1kΩ — D4 30V
Q3 Q4 NTMFS4935NT1G — HIGH_SIDE_R — R2 0805 1kΩ — D5 30V
Q5 Q6 NTMFS4935NT1G — LOW_SIDE_L — R3 0805 1kΩ — D6 30V
Q7 Q8 NTMFS4935NT1G — LOW_SIDE_R — R4 0805 1kΩ — D7 30V

24V — MOTOR_P — M — MOTOR_M — C3 0.1uF 50V

U2 IRS2186STRPBF — D3 30V BOOTSTRAP_R — C1 8200pF 500V — C5 0.1uF 50V
TP2 HIGH_SIDE_M — DIR

J2 1935187 — PWM, DIR — TP3, TP5 — D8 3.3V ESD5Z3.3T1G

U4 74AHC1G04GW,125 — Vcc, Y, NC, A, GND — DIR_INV — TP4 — C6 0.1uF 50V — C7 0.1uF 50V

U3 TC7WH08FK,LJ(CT — Vcc, A1, B1, A2, B2, Y1, Y2, GND
DIR, PWM, DIR_INV, PWM — HIGH_SIDE_P, HIGH_SIDE_M

R5 0805 100Ω — D9 DIO_LED_G — 3V3
R6 0805 1kΩ — D10 DIO_LED_Y — 17V
R7 0805 1kΩ — D11 DIO_LED_R — 24V

Current Calculations

Green LED voltage drop: 2.2V
- I = (3.3-2.2V)/100 = 11mA

Yellow LED voltage drop: 2.2V
- I = (17-2.2V)/1000 = 14.8mA

Red LED voltage drop: 2.0V
- I = (24-2.2V)/1000 = 24mA
=> 25mA tolerant on continuous current but 100mA tolerant on surge current

Title H-bridge and gate drivers		
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